JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

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EDITORIAL NOTES.

The Coronation.

ONCE again it behoves us to preface the ordinary matter of our "Editorial Notes" with a dutiful reference to the Imperial topic which filled all British hearts and minds during the past week; but now it is with a feeling of unalloyed thankfulness that we approach an exceptional task, which is to record the fact of the auspicious Coronation, on Saturday last, of Their Majesties King Edward the Seventh and Queen Alexandra. When, under the stress of the Providential visitation that necessitated the indefinite postponement of this high function from the first appointed date in June, we ventured to observe that the touch of Fate had dignified into tragedy what had threatened to be a commonplace glorification of earthly "might, majesty, "dominion, and power," it was impossible to foresee so early and more than complete compensation for such an impressive demonstration of the vanity of all human plans. In the circumstances, it is permissible to own that, before a watching world, God has visited His people, and lent to our growing Imperial sentiment, just when it had threatened to become mere pride of race and place, the sense of the provisional character of earthly concerns which men may only lose at their peril. It has been better so—infinitely better. Popular expressions of joy, the national holiday-making, the feasting, the decorations and illuminations, gained, in the possession of a fresh element of solemnity, the best safeguard against the danger of degeneration into anything that could be contemned as unseemly. The Imperial watch-word of Saturday—"All's well!"—that boomed and flashed round the world from the cradle of English monarchy in Westminster, had no unworthy echo; and with this comfortable reflection let one and all turn again to our business, and take our ease in our various ways, as a grave people who, because we knew how to bear chastening with resignation, have now been permitted to rejoice with measure and understanding.

The Gas Regulation Bill.

IT is to be hoped that the fussy—for it is this rather than serious—agitation which has raised itself sporadically in various parts of the United Kingdom in regard to the supply of carburetted water gas will be pacified by the Bill for "the "Regulation of the Supply of Water Gas and other Poison-"ous Gases," which has just been introduced in the House of Lords by the Earl of Dudley. This measure provides that the Board of Trade, after consultation with the Local Government Board and the Secretary of State, may make regulations "with respect to the supply of any water gas or "any poisonous gas other than ordinary coal gas." Such regulations may "prohibit," either absolutely or during certain hours or subject to certain conditions, the supply of such gas containing more than a specified proportion of carbonic oxide; or may "provide for notice being given" to consumers before any such gas is supplied; or may "provide for tests" of the quantity of carbonic oxide present in the gas; or may "require the odorizing" of any water gas or poisonous gas other than coal gas; or may give powers to inspectors of factories and mines to enforce the regulations. Regulations made in this sense may be either general or particular—that is to say, they may apply for the supply of water gas or poisonous gas other than ordinary coal gas anywhere; or they may be made of special application to any company or authority. Mixtures of gases are to be dealt with in the same way. Contraventions of the regulations are to be visited with a penalty of £20 and a continuing fine of £5 per day. The short title of the measure is "The Gas Regulation Act, 1902." It will be perceived that this is merely an enabling Bill, designed to empower the Board of Trade to act in a matter in regard to which they have at present no powers whatsoever. The Bill dispenses with a preamble; so that it is only possible to guess at the reasons that have caused its production. There will be plenty of time to act in regard to it before it can possibly go much farther; but when it does get fairly under weigh, it will be somebody's business to inquire what it means, and what is likely to ensue on its becoming law.

Rating of London Gas Undertakings.

THE subject of the heavy and ever-increasing local rating of London industrial property was mentioned at the recent meeting of the Gaslight and Coke Company by the Governor, in words which were all the weightier for their studied moderation. We had already noticed that this much-to-be-pitied undertaking had simultaneously experienced a serious loss of profit and a heavier charge for rates; and the Governor, in his speech on the affairs of the Company, very properly improved the occasion by publishing the fact that the rating of the concern now accounts for upwards of 3d. per 1000 cubic feet of gas sold. He specially desired the attention of Lord Welby, the Chairman of the Finance Committee of the London County Council, and of Mr. Beachcroft, one of the few members of this body who really appear to care for economy, to this figure and others bearing on the general subject. But, unfortunately, neither Lord Welby nor Mr. Beachcroft, nor anybody else, can effectually reduce the fever for expenditure which possesses the actual London County Council, and is reflected in the proceedings of the Metropolitan Borough Councils. Somebody a year or two ago remarked that the public debt of London is relatively small; and since then the Progressive majority of this body have set themselves to alter the fact. Unless something occurs to curb their extravagance, the present Council will bequeath to their successors an enormously increased debt, without any correspondingly enlarged and improved estate. The conduct of the Metropolitan Borough Councils is a great deal more reckless. From Poplar to Fulham, and from St. Pancras to Newington, these local bodies, through their Progressive majorities, are spending money right and left, both capital and revenue, heedless of who is to pay in the end. The circumstance of the Metropolitan Gas Supply not being municipalized is a mere theoretical detail, in face of the enormous subventions which the Gas Companies already pay in the shape of rates. The Metropolitan municipal corporations would have nothing to gain by becoming the nominal owners of a gas undertaking from which they already draw an income after the rate of 3d. per 1000 cubic feet of gas sold. From the financial standpoint, these bodies had far better leave all these enterprises—gas, water, railways, and other large hereditaments—in the possession of the actual proprietors, so long as they can rate the properties to their hearts' content. There is many a municipal gas undertaking envied of the Progressive with his passion for municipal trading, which returns a profit in aid of local rates of much less than the payment of the Gaslight and Coke Company in the same sense.

This truth, of course, it does not suit the Progressive politician to recognize; but it is one that should be kept well in evidence. The only hope for owners of large properties, such as gas undertakings, for the restoration of local rating authorities to sanity, rests in the fact of others sharing the burden of over-rating with them. In time, the multitudinous working class will feel the pressure through their advanced rents, which not all the ingenuity of Progressive orators will always avail to ascribe to that dumb bearer of obloquy, the ground landlord. Where the owner of small property has to pay an additional 3d. in rates, he will charge his tenants 4d. or even 6d. Sooner or later, the boot will be put upon the right leg in this regard; and then Progressivism will go out of fashion at the Sunday clubs. Municipal electric lighting is one of the luxuries the small householder will have to pay for in this way; and he will not like it. We understand there is a Metropolitan borough wherein the rates have risen from 7s. to 10s. in the pound, during the rule of the present Progressive majority, owing to electric lighting and other blessings of civilization. In

face of such imposts, Imperial taxation seems to be scarcely worth all the discussions that it receives in Parliament and in the Press. An obscure handful of Socialists and Trade Unionists, able to command the voting power of the workmen's clubs and other organizations, can, in their spheres of influence, levy taxes of a weight beyond the power of the strongest Imperial Government to impose. This is what democratic local self-government comes to, in actual practice. It is a phenomenon much easier to describe than to alter for a better state of things, in a society so hopelessly divided as that of London.

Report of the Chief Inspector of Alkali Works.

THE annual reports of the Chief Inspector under the Alkali Works Regulation Acts supply a useful and interesting mass of information relating to the conduct of the class of industries which, according to the observation of Lord Beaconsfield, constitute the most trustworthy index of the progress of material civilization. The bulk of the report which has just been issued, where it touches the gas industry, is reproduced elsewhere. What is stated there speaks for itself; we have therefore to deal here only with certain aspects of the work of the Inspectors which rather appear from the text of the report than can be said to be specified. To begin with, one may inquire what significance should be attached to the Chief Inspector's remark that "both number "of works and of processes show reduction on the whole "compared with 1899 and 1900." Does it mean that the chemical industry of the country is failing? If so, this would be a most grave symptom. The statistics which bear out this observation do not enable anyone to judge of the importance of the discontinued works and processes. In this respect, numbers without scale do not convey much meaning. Still, it would undoubtedly have been more gratifying to learn that fresh chemical industries are springing up on every side, which does not happen to be the case. It is not a little curious that, for all the enormous range of chemical science as represented in text-books, the number of actual separate chemical manufacturing processes in industrial operation is small, and does not increase. The manufacture of sulphate of ammonia from gas liquor continues to engage the critical attention of His Majesty's Inspectors, who do not seem easy to satisfy in respect to points of detail. We desire to express once more the indebtedness of the gas industry to the Inspectors for their able and conscientious treatment of the difficulties encountered in the working of sulphate of ammonia and allied processes. As a matter of fact, the production of sulphate from English gas does not increase so fast as it did, in consequence of the growing use of carburetted water gas auxiliary plant. The production of the salt, moreover, from other sources does not increase very fast, showing that it is not exactly a determining influence in the control of fuel-consuming processes generally. The Mond production of sulphate is spoken of as expected; but it was not realized. Tar-works, at one time a terror, appear to have shed all the vices of their youth, and to have become quite amiable members of industrial society.

Parliamentary Committee on Private Business.

A MASS of very interesting conversation has taken place under the auspices of the House of Commons Committee on Private Bills. Many witnesses have testified to the generally satisfactory character of the tribunal which deals with the legislative aspirations of private parties; and nobody has said anything in favour of the once popular nostrum of "devolution." When the reform of county government was taken in hand, it was considered by some that County Councils might advantageously be entrusted with certain of the work now done by Government Departments and Committees of the Houses of Parliament; but the suggestion has not borne the test of time. This is not merely, or chiefly, because the county authorities do not fully answer the sanguine expectations formed of them. It is mainly because most promoters and opponents of Private Bills would find it more inconvenient to transact business with County Councils than they do by the existing system. There seems to be a general agreement that the Provisional Order arrangement works satisfactorily; but much difference of opinion prevails with regard to the expediency of extending this very convenient system. The reason for this is that any considerable extension of the scope of Provisional Orders would entail increased risk of opposition, which would at once destroy the economy, which is the chief advantage of the system. In regard to the dealings of Parliamentary Committees with Bills, as much was said against as for the suggestion to have Joint Committees. It is a telling theoretical objection that the double inquiry involves needless expense and trouble; but this is met by the practical observation that, as a matter of fact, few Bills are fought in both Houses. It was suggested that Provisional Order Confirmation Bills might be referred to a Joint Committee. Of course, the local authorities asked for exceptional treatment by Parliament. A witness who spoke for the Urban District Councils Association wanted all Bills of such bodies to go forward at half price, for the remarkable reason that they were obliged to promote Bills, whereas companies promote Bills "for their own commercial advantage." This is a representation of the facts that will not carry much conviction. The obligation to go to Parliament for new and additional facilities is not commonly esteemed an advantage by anybody subject to it, and if there is any question of the real necessity of parliamentary promotions and oppositions, it might be raised as frequently in regard to the proceedings of local authorities as to those of companies.

One point made by the Acting Chairman of the Court of Referees deserves particular attention. This was that the power to give *locus standi* to petitioners could be extended to cover cases in which substantial interests might be affected, although no legal right was in question. This raises a very broad consideration indeed; and inasmuch as acceptance of the principle would greatly complicate matters, it is hardly likely to command the adherence of Parliament. A somewhat analogous suggestion is that the Court of Referees might be charged with the duty of deciding whether or not there should be a debate on a Private Bill in the House. If this were the rule, promoters would be spared the present very real risk of having Bills that are carefully prepared for consideration on their merits, thrown out by a snatched or party vote in either House. Scarcely a session passes without furnishing examples of this kind of scandal; and it is distinctly unfair to petitioners to make their interests the sport of politicians. It is quite true that instances constantly occur as to which it is difficult to say how far a Private Bill affects public interests. But this is a question that a strong Court of Referees should be quite competent to answer. From the same quarter comes the proposal that the Committees ought to have a firmer grip of unopposed Bills. This is a highly important suggestion. At present, it is no use for a Committee to say that a Bill coming before them as unopposed ought to be opposed in respect to any particular, because there is nobody to do it. The proposal is that the Speaker's Counsel should oppose, whenever the Chairman of the Committee might so decide. Here, again, the alteration would make a new complication, because petitioners would require permission to meet the objection if necessary by Counsel and witnesses. Still, subject to this point, the idea is not a bad one.

Manchester Gas.

THE principal figures expository of the last year's working of the Manchester Corporation gas undertaking were given in last week's "JOURNAL." They do not call for much particular comment, but constitute an account upon which the city may well be congratulated. The increased output of 2·89 per cent. for the year is reassuring, seeing the extension of incandescent lighting that is going on and the rapid growth of the Corporation's electricity supply undertaking. Moreover, in the able and careful hands of the present Engineer, Mr. James G. Newbigging, the general improvement of the working and also of the whole of the plant has already progressed far enough to show in the statistical statements that are published with the accounts. The carbonizing returns are very much better in every respect, and the proportion of unaccounted-for gas has now been brought down to the low average of about 3 per cent. We notice that the ratio of gas sold by ordinary meters within and outside the city is about $4\frac{1}{2}$ to 1; by prepayment meters, as 9 to 1; public lighting, as nearly 6 to 1; and stove hire, not 2 to 1. At what prices is this business done? The Manchester Corporation are in the position of a gas company towards the proportions of their customers here stated, charging them their rateable part of the subsidy of £50,000 per annum paid over to the city fund, "free of

"income-tax," and even making them contribute towards the payment of nearly £1000 a year to the Corporation Thrift Fund. We are not questioning the policy of these charges for the moment, but only stating the facts. The outsiders have borne their share of the million sterling paid into the gas sinking funds for clearing the Corporation property. There is published this year a full abstract statement of capital, revenue, and profit and loss accounts of the Corporation undertaking from the commencement in 1843, the date when the gas-works were taken over by the Corporation from the Commissioners of Police. The total amount applied in relief of the city rates is £2,509,301. A sum of £82,696 has been applied out of profits in works extensions. Three-quarters of a million has been written off for depreciation. Towards all this, the outside consumers have all along contributed 8d., 6d., 4d., or (as at present) 3d. per 1000 cubic feet in excess of the consumers' prices within the city. They now pay 3s. per 1000 cubic feet for their gas. It is to be hoped they think it is worth the money. Notwithstanding all they have already paid off, the consumers of Manchester gas are charged enough to pay about 6½ per cent. on the gross capital expenditure from the beginning, less the amount written off for depreciation. This brilliant example of municipalized gas supply would have a totally different aspect but for the contributions of those consumers to whom the concern is as a gas company. The city rates amount to £36,674, which is about 1·8d. per 1000 cubic feet—another bit of profit. These are matters which the Manchester Corporation ought to consider in a broader way than they have hitherto adopted in the administration of this splendid property.

The Apotheosis of the Hefner Lamp.

THE interesting record which we give elsewhere (p. 397) to-day of the good work done during last year at the Imperial Physical-Technical Institute (the "Reichsanstalt") at Charlottenburg in the direction of verifying Hefner lamps for use as standards of light in photometry, concludes unfortunately with a notice that the Institute has decided in future to adopt the term "Hefnerkerze" (Hefner-candle) to denote the mean intensity of the light afforded by a Hefner lamp burning under normal conditions. The term has already been widely adopted in Germany, and in its Anglicized form by electricians in the United States. We have before now entered a protest against its use, because it is both illogical and misleading; and we regret to learn that the Reichsanstalt has now given its sanction to this abuse of terms. The Hefner lamp is not of the nature of a "candle," and the intensity of its light is sensibly less than that of any recognized standard candle—being, indeed, according to researches made at the Reichsanstalt, only 0·877 of the mean light of an English sperm candle, which again has a slightly lower value than the German standard paraffin candle. The fact is, it suits electricians and others anxious to attach high nominal illuminating value to a feeble glow lamp or what not, to have a depreciated candle standard; and the Hefner unit serves their purpose very well indeed if only they can speak of its intensity as one candle, with or preferably without the qualification "Hefner." The old term "Hefner unit" misled no one; the term "Hefner "candle," which the electricians have, by dint of perseverance, brought into common use, misleads every day. The light of a glow lamp is determined in "Hefner units" but is recorded as that number of Hefner "candles," until, for the sake of brevity, "Hefner" drops out, and it becomes "candles" merely. It is a matter of every-day occurrence in Germany. Advertisers quote the illuminating power of lamps, burners, &c., in "candles," when their figures really refer to "Hefner units," and should be diminished by one-eighth to justify the use of the word "candle." Gas managers unfortunately cannot so easily secure a reduction by one-eighth of the value of the standard by which the statutory illuminating power of their gas is assessed. Hence, we again protest against the "Hefner-unit" of light being termed a "candle," for the advantage of electricians and others whose "candle" is not defined by statute.

Nothing like Pitch.

IT is rather a satire on the economic value of that development of organic chemistry which is understood to be a German speciality, that the price of coal-tar products is not enhanced by the various wonderful uses to which they are put in this modern alchemy. The madder industry has been destroyed; but anthracene, which killed it, no longer interests buyers. It is reported that indigo is going the same road; yet naphthalene, which is to be its bane, is not making anybody's fortune. Very singularly, the only product of any particular value at all for which it pays to distil coal tar is pitch—the last residuum of everything! Pitch has risen 50 per cent. in value during the current year, and appears to be in increasing demand. What gas companies chiefly need is a rough-and-ready process for turning all their tar into pitch. They might throw away all the distillates! The activity of the electrical industries, and the amount of work that is being done in wood-block paving, are understood to be the real reasons for this great demand for pitch; and they are not causes which are likely to fail at an early date. Consequently, the popularity of pitch may be expected to last for a considerable time to come. If the movement that has already set in in some localities should be extended to others, and the making of road surfaces of tar macadam should become really the fashion, the demand on the gas-works of the country would be larger still. There can be no question that the increasing vogue of motor-cars on common roads will foster an agitation for a better surfacing than has hitherto served well enough for horse haulage, and especially for a surface that does not make dust. So far as present knowledge goes, tar macadam is the only material of which such improved roads can be made at a reasonable cost; and its employment is certain to be called for.

Illuminated London.

London was literally ablaze on Saturday night with the illuminations in celebration of the deferred ceremony of the Coronation of His Majesty King Edward the Seventh and his Queen. That event was happily consummated with becoming pomp and splendour; and if the gratification of the inhabitants of the Metropolis thereat is to be measured by their display of decorations and illumination devices, it was a feeling very generally prevalent. From the aristocratic regions of the West-end down to the poorest neighbourhoods, a desire was manifest to mark the day as one of national rejoicing. As far as illumination is concerned, it was probably on a larger scale than had ever previously been attempted. From Hyde Park Corner to Aldgate, there was a succession of more or less elaborate devices. The centres of greatest attraction were, of course, Pall Mall and the neighbourhood of the Mansion House, where the crowds were very dense indeed. In both localities the devices in which gas was the illuminant came in for much admiration. As these have been described in previous issues of the "JOURNAL," it is only necessary now to bear testimony to their beauty and effectiveness in operation. Unquestionably, the finest piece of single gas-jet illumination was that of the West-end branch of the Bank of England in Burlington Gardens, which was illustrated in our issue for the 15th ult.; and we can only repeat the regret then expressed that Messrs. Sugg's ingenuity should have been exercised upon a building situated in a back street off the main thoroughfares. It was certainly well worth the *détour* it involved to see it. Inspection of the illuminations justifies the remark already made that, with the exception of the novelties introduced by some of the banking-houses in Lombard Street, there was a want of diversity in the devices employed. This was, to a certain extent, unavoidable. At the same time, the Bank of England, its two neighbours, and its West-end branch were conspicuous examples of decorative illumination by gas; while those on a less extensive scale to be seen all along the route indicated above furnished ample evidence of its capability of doing useful work in connection with an event of the highest national importance.

Marketing under Electric Arcs.

One is often reminded in the Press of the unsurpassable beauty and suitability of the electric light for shop illumination. It may be that this is true in some cases, but not in all, as certain of the occupiers of the stalls in the Market Hall, at Birmingham, are only too pleased to testify. The hall is lighted by electric arc lamps; and so far as the illumination is concerned, it is really on a lavish scale. Yet the stranger passing through the market

is struck by the fact that a number of the stands are lighted by the old-fashioned flat-flame gas-jet; and inquiry brings an interesting fact to notice. When the electric light was first introduced, gas was evicted from the hall; but it was not long before the stall-keepers re-instated it on their own account. Under the electric arcs, the flower, fruit, and meat sales began to fall off; and the salesmen could not at first understand why it was that customers were less tempted by their wares than formerly. Then it was noticed by the stall-keepers that the flowers, fruit, and meat did not look so attractive as they previously did under the golden rays of gas-jets. The flowers seemed, directly they were brought under the electric arcs, to lose their brilliance of colour; the rich, ripe fruit looked dull and uninviting; and the meat had a blue appearance which made would-be customers suspicious of staleness. Then someone whispered to the stall-keepers that the blue rays of the electric light were responsible for the defamation of their goods; and first one and then another brought in flat-flame gas-jets for the purpose of intercepting those blue rays. And they succeeded. To the eye, the fullness of colour in the flowers and fruit was restored; the meat again presented its former freshness; and the confidence of customers was regained. There is one large fruit stall just by the main entrance of the hall still depending upon the light from the arc lamps; and an inspection of the products of the field and garden on that stand shows the illusory and harmful tendency of the electric light which was experienced by those owners of other stands who have returned to gas. While the electric arcs supply the general illumination of the Birmingham Market Hall, gas will not again be banished from many of the stalls. It seems a strange thing, however, that the authorities should continue a system of lighting that has proved itself injurious to the trade of those occupying the hall. But a good round sum must have been spent in putting down the electric-lighting plant; and apparently this is regarded—wrongly we think—as a sufficient justification for continuing the system.

Dear Coal.

The remarks which were addressed to the shareholders of the Bromley Gas Company at the meeting last week by the Chairman (Mr. Alexander Dickson) were of a highly interesting character, not only to the limited number of persons whose privilege it was to hear them, but to all who are concerned for the welfare of the gas industry generally. His Company, like others want cheaper coal; and this he thinks they are fairly entitled to have. Yet the utmost they have been able to obtain on the coming year's contracts is a concession of 1½d. per ton. This led Mr. Dickson to say what the "JOURNAL" has said many times before—namely, "that the bolstering up of the high prices of coal by the combinations among the owners, and by idleness enforced upon the workers, constituted a serious menace to the industrial interests of the whole community." This is quite true—so true, in fact, that we can only regret that Mr. Dickson did not see his way to suggest some effective means for bringing both the coal miners and the owners to reason. That the problem is a difficult one must, however, be admitted; for, in view of the enormous sums of money they have at stake, it can safely be taken for granted that the big coal users have long ere this turned their attention towards its solution. In support of his contention, Mr. Dickson referred at some length to a report of the recent annual gathering of the Northumberland miners. From this, it appeared that the rate of wages paid is at present 26½ per cent. above the basis of 1879, and also above what the sliding-scale would have given on the same prices; that last year there were 26,000 more men employed than in the preceding twelve months; but that in spite of this the output decreased by 6 million tons. These facts led Mr. Dickson to ask the two following questions, to which we do not think it will be difficult for our readers to supply correct answers: "If 26,000 more men output 6 million tons less in the year, has there been the same honest diligence for the day's pay as previously, and has work been continued with reasonable regularity?" and: "Is the rate of pay still so high that holidays can be ordered to limit the output for the purpose of keeping up prices?"

Temperature and Gas Consumption.

Some further testimony has in the past week been forthcoming with regard to the question of the effect of temperature on gas consumption; and in both cases the evidence goes to prove that when in winter the temperature is above the normal for the time of year, it acts restrictively on the consumption. Mr. Howard C. Ward, the Chairman of the Brentford Gas Company, at the half-yearly meeting, took special pains to refute the assertions made by "scientific journalists" that the weather had little to do with the amount of gas passing the station meters. During the first three months of the present year, when the weather was very mild, the increase in the quantity of gas sent out by the Company amounted to only 4 per cent. During the last three months of the half year, however, they experienced an increase of 7 per cent. in their output. In the case of the Bromley Gas Company, there was an actual deficiency in the total consumption over the first four months of the year; but during May and June (when a lower temperature prevailed), this deficiency was transformed into a substantial gain. If the present sort of weather should continue, there ought to be some very instructive comparative figures forthcoming at the next meetings of these two Companies, when the accounts for the last six months of the year will be under review. Meanwhile, we must leave the gas shareholder to extract what comfort he can from the knowledge that the existing climatic conditions will not, to him at all events, be altogether without recompense, inasmuch as they will tend to increase the prosperity of the undertakings in which he may be interested.

A Progressive Midland Gas Company.

In view of the fact that a number of gas undertakings have not of late been doing quite so well as usual, the Derby Gas Company are to be congratulated on having just had one of the best half years on record. Notwithstanding reductions made last September to the extent of 3d. and 5d. per 1000 cubic feet in the price of gas for lighting and motive power respectively and a fall in the returns for residuals—involving a diminution of rather more than £5000 in the revenue—the Directors have been able to pay the shareholders the maximum dividends, and carry about £3000 to the reserve. This satisfactory position is largely due to the skilful management of Mr. J. Ferguson Bell, whose achievements in the carbonizing department were eulogized by the Chairman on the occasion of the half-yearly meeting reported elsewhere. Though there was a drop in the revenue, there was also a reduction to the extent of £4000 in the expenses. The Company have lately enlarged their sphere of operations by acquiring the undertaking of the Duffield, Allestree, and Quarndon Gas Company, and have ingratiated themselves with the residents in these places by lowering the price of gas 10d. per 1000 cubic feet, and encouraging its use for cooking purposes. The result is, as might be expected, a rapid rise in consumption—the usual concomitant of a liberal policy. All this means increased prosperity. A very different condition of things is noticeable in connection with the electric light undertaking of the Corporation, which is being run at a loss of about £3000 a year, which, of course, has to be made up by the ratepayers, one of the largest of whom is the Gas Company. No wonder, then, that the Chairman protested against the increased rating. It would have been surprising if he had not done so, seeing that the Company are compelled to assist in supporting a rival concern, from which they cannot expect anything but competition. One consolation is that the competition will probably not be very harmful.

Another Use for Gas-Works Residuals.

Gas-works residuals, while being most helpful to those who produce them, are also of the greatest possible utility to many other industries; and now a suggestion comes from Paris that they might be of assistance in laying the dust in country roads. In France a great deal of trouble is in the summer time caused by dust; and this has been aggravated by the large increase that has recently taken place in the motor traffic. To obviate the nuisance, a proposal has been brought forward by M. Deutsch and others that the roads should be oiled or coated with "chemicals produced by the distillation of coal in the course of the manufacture of gas;" and we learn from the "Standard" that experiments which have just been made on a very dusty road in the vicinity of the French capital have proved highly successful—the air on the portion of the surface which was treated with

tar or oil remaining very pure and clear, despite the passage of a stream of motor-cars. As our contemporary remarks, however, even if the plan is in other ways a success, the question of expense will remain to be looked into; and it will, moreover, have to be ascertained whether the emanations from a chemically treated or oiled road, under the influence of a hot sun, might not be unpleasant. No doubt further trials on a larger scale will do something towards settling these two points.

A Bit of Trades Unionism.

Our columns have from time to time related some strange instances of Trade Union tyranny and stickling for the strict letter of their rules, no matter what absurdity was thereby involved. But perhaps nothing could exceed the idiocy of the men's "leaders" in a case mentioned in the current issue of "Cassier's Magazine," and truly styled by our contemporary as "a rather good, or bad, story illustrating the arrogance, ignorance, or whatever it may be called at the executives of some of the Trades Unions, in dealing with their members." It appears that while a workman was engaged in guiding a cable into a conduit in a building that was being wired, his fingers were caught between the cable and the walls of the conduit. The men at the far end of the conduit, unaware of their comrade's plight, continued to pull upon the cable, seeing which an apprentice lad ran to his assistance, and pulled back on the cable. A delegate of the Union who had witnessed the affair, and had expressed sympathy for the sufferer, reported him for violation of the rules of the order, and the latter was called to executive headquarters to explain his conduct. Notwithstanding that his fingers bore evidence to the extent of the accident he had undergone, he was fined "for allowing an apprentice to do helper's work—to wit, assisting a journeyman drawing wire into conduits."

A New Balanced-Drum Gas-Meter.

In another part of the "JOURNAL" will be found an illustrated description of a new balanced-drum gas-meter which M. Foiret, its designer, described at the recent congress of the Société Technique du Gaz en France. The production is interesting as furnishing evidence of an attempt—and apparently a successful one—to bring up to date an important instrument connected with the supply of gas; in other words, to make it equal to the changed conditions of that supply. It is rather a curious circumstance that there has not been any very great departure from the principles laid down by Clegg and his successors in regard to the construction of the meter drum. About 100 revolutions per hour have been regarded as the normal speed for all sizes of meters; but M. Foiret says there is no rational basis for this rule, which was all very well in the old times anterior to the use of cooking appliances and gas-engines. Now, the object is to get increased duty from a meter; and this he claims to be able to do with the one he has designed. Judging by the results of the trials to which it has been subjected, he seems to have substantiated his claim. At all events, he shows that a "Duplex" drum having a capacity of 70 cubic feet, will make from 250 to 313 revolutions per hour, and pass as much as from 420,000 to 530,000 cubic feet of gas per day. Such results call for attentive consideration.

The Garden City Scheme.

The great efforts which have been made by Mr. E. Howard to induce others to take a practical interest in his well-known Garden City scheme (to which attention has on more than one occasion been called in our pages), have at last met with some success; and a Joint-Stock Company has been registered under the title of the Garden City Pioneer Company. The capital of the venture is £20,000; and of this nearly a quarter has been conditionally subscribed by those who have already taken a lively interest in the objects aimed at by the promoters. The Board will be a very strong one, including as it does men of the highest reputation in commercial circles. Among other well-known names may be mentioned those of Mr. Edward Cadbury, Mr. T. H. W. Idris, and Mr. H. D. Pearsall. The progress of this novel undertaking will be carefully watched by all large employers of labour who are anxious to do everything in their power to contribute to the welfare, moral and material, of those dependent upon them; and it is to be hoped that the Company will be successful in establishing, if not their ideal, at least something approaching it. No doubt the main object of the promoters is a philanthropic one; but provision is to be made in the constitution of the Company for a limited return on the capital. This the shareholders will certainly deserve, if they are successful in attaining, even partially, the end they have in view.

WATER AFFAIRS.

The London Water Bill in Suspense.

THE slight progress made with the London Water Bill in the two afternoons devoted to its consideration by the House of Commons in Committee has given rise to a feeling in certain quarters that it will be impossible to pass the Bill this session—that, in fact, there is no intention to pass it, as the Government are by no means enamoured of their scheme. Our contemporary the "Newcastle Chronicle," in which the foregoing opinions find expression, says that those who usually know something of coming events say with a very positive air that the Bill is as good as dead. It hopes these people are right. We venture to think they are wrong. True, when the House rose on Friday, the first clause had not been entirely disposed of; and on the reconsideration of the measure on the reassembling of Parliament in October, the members will be confronted with a formidable array of amendments. But we nevertheless think the Bill will pass. Indeed, the Prime Minister told Mr. Dillon on Friday that it "must" be passed, as well as some others of an administrative character. The Bill of the London County Council is withdrawn; and the only great legislative proposal to engage attention in the autumn session will be the Education Bill. As the difficulties surrounding the seventh clause have now been overcome, it is justifiable to expect that more rapid progress will be made. This will leave more time for the Water Bill. All things considered, therefore, we do not agree with those who regard the Bill as being as good as dead. It is rather, we should say, in a condition of suspended animation. If it does not survive the ordeal through which it will pass in the autumn, it will not be because of its abandonment by its promoters, but by reason of the defection or the indifference of their supporters.

Differential Water-Rates at Northampton.

WHILE the general public were making holiday on Monday last week, Mr. Justice Bigham was engaged in hearing and deciding a dispute which had arisen between the Corporation of Northampton and some of the water consumers in the borough. The question at issue was the right of the Corporation to charge differential rates in their area of supply. By the Act under which they acquired the waterworks in 1884, they were empowered to charge 7½ per cent. on the rateable value of the premises for water supplied thereto; and in the event of this being insufficient to meet expenses, the balance was to be made up out of the general district rate. About two years ago, the boundaries of the borough were extended under a Provisional Order, one of the articles in which set forth that the combined borough, poor, and any other rates in the added area should not in any one year, during a period of ten years from the commencement of the Order, exceed 5s. 6d. in the pound. Things went smoothly until early last year, when the Corporation took into consideration the question of the method of levying the water-rate, with the result that at Midsummer the charge in the borough as originally defined was reduced to 5 per cent.—the higher figure being continued only in the added portion. This action, which was avowedly directed against certain non-consumers of water, was justified on the ground, among other reasons, that the ratepayers in the lately included area, whose liability for the district rate was limited, would not have to bear any part of the extra burden thrown upon it by the reduction. The parties specially affected protested against the Corporation's action, and questioned its legality. In this they were supported by Mr. Balfour Browne, K.C., who, on the facts being submitted to him, expressed the opinion that the differential rate could not

lawfully be charged. Armed with this opinion, a test action was commenced, and a case stated for the High Court. Mr. Shiress Will argued that the Corporation were entitled to ask the residents in the added area to pay more for their water than the burgesses proper, seeing that they could not be called upon to assist in making up a deficiency in the district rate. Mr. Horace Avory, on the other hand, contended that they had no more power to charge a different rate for water in the same borough than a water company had. His Lordship agreed with him. He thought that the terms of the Act of Parliament were perfectly clear, and that the intention of the Legislature was that no distinction should be made. He therefore decided for the defendant.

An interesting point was raised in the second question in the case stated—viz., whether the words "any other rate," in one of the clauses of the Provisional Order under which the boundaries of the borough were extended, did not include the water-rate. The defendant submitted that, inasmuch as the poor, borough, and district rates payable by him amounted together to 5s. 6d. in the pound—the maximum specified in the Order—he was not liable in respect of the sum charged for water, which he contended was included in the words above quoted. Mr. Avory, on his behalf, argued that as the list of ordinary rates was exhausted by the phraseology of the Order, there could not possibly be any other than the water-rate to include. His Lordship could not agree with the learned Counsel in his contention on this point; saying that new rates were constantly cropping up. He put the case of the Corporation acquiring the gas undertaking, and suggested whether, if the argument adduced were accepted as sound, the charge for the gas supplied would not be a rate. Counsel replied that it would not, as the suppliers could not charge a percentage on the rateable value of a house, but had to adopt the system of payment by measure. His Lordship did not think this made the slightest difference. He pointed out that the water-works were acquired in 1884, and that when the Extension Order was granted the water-rate was already in existence. He said he could not help thinking that if the Legislature had intended that rate to be included in the words upon which the defendant relied, it would have been specifically mentioned. In his opinion, the fact of the charge for water being called a "rate" did not bring it within the terms of the Order, and consequently it must not be taken into consideration in making up the maximum amount of the general district rates in the added areas of the borough. We do not, for the moment, recollect any case in which the defendant's contention on this point has been seriously put forward; and therefore it may be of interest to direct attention to his Lordship's ruling.

Question as to the Maintenance of a Water-Pipe.

It seemed as though Mr. Justice Bigham was fated to have to deal on Bank Holiday with difficulties connected with water supply. In addition to the matter above referred to, he had to give judgment upon a point submitted to him in a special case stated by an Umpire. About ten years ago, three adjoining Local Authorities in North Wales formed themselves, under a Provisional Order, into a Joint Board for providing water for the common use of their districts—the water being brought to the boundary of each. In course of time, the Colwyn Bay Urban District Council laid a main for supplying water in their district; but it also delivered some to Llysfaen, in the area of the Conway Rural District Council. The cost of maintaining the pipe was for a time borne by the two Councils, in accordance with an award by Mr. Balfour Browne, in proportion to the length lying within their respective boundaries. But it was afterwards urged that Conway should pay Colwyn something towards the cost of maintaining the portion of the main in the latter's district, because it was part of a distributing system by which Conway was directly benefited; and the Umpire fixed the amount at £40 per annum. The question his Lordship had to answer was whether this sum, or anything whatever, was payable; and he decided that nothing could justly be demanded. He said the work was really done by the Colwyn Council for their own benefit, and not at the request of the Conway Council, and the fact that Conway happened to derive some advantage therefrom was no justification for the claim. He set aside the award, and granted costs. In view of this decision, the Colwyn Bay Council, at their meeting the next day, considered the advisability of cutting off the water supply to Llysfaen by plugging the main, or, as an alternative, taking the matter to a higher Court. Eventually, however, it was decided to have Counsel's opinion on the exact position of the authority before moving further—the Solicitor (Mr. Amphlett) pointing out that the first course suggested, though strictly legal, was a remedy too desperate to be contemplated.

Water-Power Pumping Plant.

The question of the utilization of water power has naturally a great fascination for engineers; and therefore it is with some confidence that we say the abstracts of the papers presented at the meeting of the British Association of Water-Works Engineers published this week will possess points of attraction for most of our water engineering readers. The papers deal with the turbine-driven pumping plants at Windsor, Reading, and Guildford. Of course, the efficiency and economy of these plants depend absolutely upon their situation. In other words, turbines are instruments that are subordinate to an outside power; and however good they may be in themselves, if the outside power is deficient at any time, then the performance of the plant is adversely affected. Where the conditions are favourable, every satisfaction is given; and this appears to be the case at Guildford, seeing that, as Mr. Mason informs us in his paper, the turbines and pumps have quite fulfilled the conditions required of them. But, in rivers similar to the Thames and the Kennet, water power is a very variable and uncertain factor to depend upon; and we find authority for saying this in both Mr. A. T. Walker's and Mr. C. Sainty's papers. Drought, floods, and especially frost, when "ground ice" makes its appearance, are all liable to cause a breakdown, or to interfere with the working of water-driven plant; and such considerations as these lead Mr. Walker to make the emphatic declaration that such plant is "unsuitable "for water-works purposes, except as an auxiliary source "of power." Up to 1890, Reading depended solely upon water-driven plant; but steam power was then added, which shows that Reading prefers to have two strings to its bow.

Of the plant at Windsor, we cannot find a word of complaint in Mr. Sainty's paper; and, in fact, it appears to be doing very praiseworthy work. But although he does not emphasize it, a little confirmation of Mr. Walker's assertion crops up early in the paper. The situation of the works is described by Mr. Sainty as being admirable; but, at the same time, the Thames, in the particular reach in which the plant is located, is described by him as being "unusually "erratic in its flow"—the consequence being that "with a "plant of this kind one has to be constantly on the alert." There is sufficient material in the statements and confessions of Mr. Walker and Mr. Sainty to cause the water engineer to be very circumspect when meditating the adoption of water-power driven plant, and to consider well the reliability of the circumstances of the position in which it is proposed to place it. In such an important matter as the water supply to a community, one does not like to be subject too much to Nature's vagaries, and to be kept "constantly on the alert." Economy does not always compensate for concomitant difficulties. But, given conditions suitable to the obtaining of the economy without inordinate anxiety and trouble, then have the economy by all means.

The contribution to the proceedings by Mr. W. Price Abell on the subject of the application of suspended steam-pumps to the sinking of deep shafts and wells was of general interest to the meeting. But it was not one which lent itself to considerable criticism, inasmuch as the members were mainly in agreement with the author; and really no one who is an engineer in the true sense of the word could be otherwise. In such work as the sinking of wells, the advice of the author, "Don't tinker," is sound. It is to be feared that "tinkering" has been responsible for a good many of the mishaps in the sinking of wells which have occasioned loss of time and money; and there can be no questioning of the truth of the statement that any reasonable expenditure in suitable tackle to prevent accident is not only a good investment, but a *sine quâ non* to success. The paper was largely taken up with an account of the system adopted in the sinking of wells and shafts by means of Evans pumps; and the illustrations given were remarkable for the expedition and success with which work has been accomplished. The discussion turned rather on the omissions of the paper than the actual subject-matter; but those who spoke were agreed as to the practical excellence of the contribution.

ESSAYS AND REVIEWS.

THE SOUTH WALES COAL OWNERS AND THE MINERS' FEDERATION.

On Thursday last Mr. Justice Bigham delivered his considered judgment in the case of *The Glamorgan Coal Company, Limited, and Others v. The South Wales Miners' Federation and Others*—more generally known as the "stop-day" case. This action, taken by the 74 limited companies comprising the Monmouthshire and South Wales Coal Owners' Association, against the South Wales Miners' Federation, its trustees, officers, and a number of the members of its Executive Council, is an attempt to recover damages from the defendants for "wrongfully and maliciously procuring and inducing the workmen in the plaintiffs' collieries to break their contracts of service with the plaintiffs," and, in the alternative, "for wrongfully, unlawfully, and maliciously conspiring together to do the acts complained of." In addition to damages, the plaintiffs asked for an injunction. The circumstances under which the members of the Federation broke their contracts of service were at the time brought to the notice of our readers, and need only be recalled briefly.

At the beginning of the winter of 1900-1, the Council of the Federation, being apprehensive that the price of coal was on the down-grade—which under the sliding-scale would be followed by a fall in wages—ordered a holiday, or "stop-day," throughout the coalfields of South Wales (without notice being given to the employers), and convened a general conference, which, at the request of the Executive Council, authorized the Council to declare a stop-day at any time they might think it necessary for the protection of the wages of the men. The employers, through their representatives on the Sliding-Scale Committee, protested against this action of the Federation, and gave notice that any future illegal stoppage would be followed by proceedings. No further stop-days were ordered during that winter; but in October, 1901, upon it becoming evident that the price of coal was again weakening, the Vice-President of the Federation made a speech to the miners in which he intimated that any "slumping of prices by unfair competition" would lead the Executive Council to declare a series of stoppages, to regulate the supply according to the demand. The Executive then, however, awoke to the fact that, since the last stop-day had been ordered, the House of Lords had pronounced that very inconvenient judgment known as the Taff Vale judgment, and that consequently it was decidedly inexpedient for the Federation, with £100,000 at the bank, to incur responsibility for a policy which the employers had warned them would lead to legal proceedings. While, therefore, it was evident from the speeches of the Vice-President and other officials that the Federation desired to bring about a series of stop-days, the Executive Council formally resolved not to take the responsibility of ordering any stop-days, and then the twelve workmen members of the Sliding-Scale Committee (who were also all of them members of the Council) immediately—the other members of the Council having left the room—ordered two stop-days at all collieries, whether represented on the Sliding-Scale Committee or not. The machinery for making this order known to the men was provided and paid for by the Federation.

This disingenuous attempt on the part of the Union to act through the workmen's half of the Sliding-Scale Committee—which had no funds to be attached for damages—and so to shirk all responsibility for its policy, received short shrift at the hands of Mr. Justice Bigham, who declared in his judgment that, "in truth, it was the Federation who were acting, the name of the Sliding-Scale Committee being used as a blind, and a very transparent blind, to conceal what was being done." For the two stop-days already mentioned, and for two more ordered shortly after, the Federation were, therefore, adjudged to be entirely responsible. The important question then for the Judge to determine was whether, the act of the Executive Council of the Federation having brought about these several breaches of contract by its members, an action in *tort* lay against them by the employers in respect of the injury done to their business and the loss occasioned to them (put at about £70,000) by these arbitrary stoppages of work at the collieries. Mr. Justice Bigham has decided that, in his opinion, the circumstances disclose no cause of action.

That judgment was founded upon the following grounds: That the Council of the Federation were in the position of advisers to the members; that, by the resolution of the general conference of November, 1900, the members had requested the Council to advise and direct them when to stop work; that, in advising the men to stop, the defendants advised honestly and without malice of any kind against the plaintiffs; and that, although the defendants were aware that their advice involved the breaking of subsisting contracts and damage to the employers, yet as there was no malicious intention to cause injury, no profit was gained for themselves by the defendants, and their sole object was to benefit the men—the defendants had lawful justification and excuse for what they did, and consequently had not rendered themselves liable in *tort*. Further, on the ground that the acts done were lawful acts, and that no malicious intention existed, his Lordship held that there was no actionable conspiracy.

This judgment, so far as we can see (bearing in mind the line of attack taken by the plaintiffs), does not conflict with nor weaken the judgments laid down by the House of Lords in recent Trade Union cases, and the jubilations in certain Trade Union quarters, based upon the assumption that the decision puts matters upon a more satisfactory footing for the Unions than before, show that either those who rejoice are ignorant of the exact bearing of former judgments or are unable to understand the real meaning of the present one—or are both. All that the Trade Union journalist sees is that judgment was in favour of the men, and that is enough for him to write as if it were a victory that could be set against such defeats as the Taff Vale decision, whereas it is nothing of the sort.

The case is, naturally, to be carried further, and the judgment of the Court of Appeal, and still more of the House of Lords, will be awaited with much interest. Two points that strike us in considering Mr. Justice Bigham's judgment are, first, that so far as we can see the stop-day policy originated with the Executive, who called in the men to sanction it, rather than with the men, who (according to his Lordship) called in the Executive to advise them; and, second, that the Federation cannot be properly considered as a third party, distinct from either employers or employed in this case. The men were the Federation, the Federation was the men; and if the men, deciding by their organization to break their contracts, did, by breaking those contracts, render themselves liable for damages (as they undoubtedly did), why should not the funds of the organization be attachable for such damages? The men, individually and collectively, committed the damage; why should they not be liable collectively as well as individually? As we have said, we await with much interest the judgment of the Superior Court on the question of whether the action of the Federation was taken "with just cause and excuse." Meanwhile, the result of the trial in the Court of First Instance is not calculated to improve the prospects of peace in the Welsh coalfields.

THE RELATIVE VALUES OF COAL AND LIQUID FUELS.

There is a certain amount of pleasure to be derived from the contemplation of good work well done in almost every department of human activity, even though the spectator may not feel specially interested in the nature of the work or the personality of the workers. In regard to a very wide range of human activities, however, there exists a strong bond of fellow-feeling between the workers, so that they can appreciate and profit by one another's efforts, albeit the immediate purposes of these endeavours may appear to be very various and disconnected. This is particularly manifest in engineering; for the reason that engineers hold more in common than their specialities distinguish between them. A noteworthy illustration of the benefit to be obtained from keeping an appreciative eye open to what is going on around one, has recently come before us in the receipt from Mr. W. B. Phillips, the Director of the University of Texas Mineral Survey, of a copy of "Bulletin No. 3" of the Survey. It deals with coals, lignites, and asphalt rocks, and is one of a series of economic publications relating to the mineral resources of the State. The first of these was on Texas Petroleum, and was so run upon that the edition is now out of print. The publication of the present volume has been pressed on by the interest created by the introduction of fuel oil, which, though dating within the last year, has made a change in industrial circles, to which the State University has quickly responded. What an excellent idea is thus suggested! Here we may see in swift action one of the chief functions of a modern University—the bringing of the best available investigating and critical skill upon a new matter of economic moment to the community. Does this not amply justify the modern notion of applying University resources and methods to the service of a living and progressive community?

It is with sincere pleasure that we are able to congratulate Mr. Phillips, who is Professor of Field and Economic Geology and Director of the Survey, on the quality of the contents of this particular Bulletin. We trust the modern Universities of England will be able to do equally good work along the lines marked out for them by their location and circumstances. There is plenty of room for it. At the first glance, it would not seem likely that English engineering students of fuel problems could glean much of value for themselves from a Texas University report; but, to one's surprise and pleasure, it immediately appears, from looking into the book, that it contains a good deal of matter of general interest and value. To start with, take the philosophical spirit in which Professor Phillips comments upon the fuel question, which is always interesting, everywhere. He observes truly that "Labour may be trained; but if there is no cheap fuel, manufacturing enterprises are built up under adverse conditions, and industries already established are not as profitable as they could otherwise be." This economic truth applies to other parts of the world as well as it does to the State of Texas.

It is said that an early effect of the discovery of fuel oil in Texas has been to depress the local lignite mining industry which was considerable and growing. Some of the seams are 14 feet thick. It sells for 50 cents a ton at the pits, and pays to

send up to 100 miles by rail. There is a good deal of bituminous coal, which has a future. Of course, the discussion of the relative merits of the various kinds of native fuels brings up the problem of calorimetry. This is the part of the report which appeals to engineering students; for much that is stated on the subject is what every engineer should know. It is explained that English-speaking people have agreed to measure heat by the standard of the British thermal unit, commonly expressed B.T.U. It is further agreed that the calorific power of a fuel shall be based upon its heat of perfect combustion in pure oxygen. This is a convention, and it is as well that the fact should be kept in view; because many, if not most, of the industrial and ordinary uses of fuels are subject to very different conditions. When this truth is overlooked, the indications of calorimetry may be misleading.

On the subject of calorimeters, it is observed that there are several forms of the instrument in use, divisible into two classes. The first class operate by the burning of a known weight of the sample under constant pressure; and the second work under constant volume. W. Thompson's, Junkers', and Lewis Thompson's belong to the first class; and Mahler's "bomb" is the commercial form of the latter kind. It is mentioned that recently another calorimeter operating under constant pressure has been brought out, and is sold under the name of Parr's Standard Calorimeter. This is the instrument used for the determinations given in the present work; and they are judged to be sufficiently precise for industrial purposes. The Mahler instrument is allowed to be more accurate; but it is expensive, and requires many accessories. Of the method of arriving at the heat value of fuel by calculation, it is remarked that, while the basis of computation is usually the ultimate analysis of the substance, some authorities prefer to take the proximate composition instead. Examples are given to show the relation between the experimental and calculated heat value of certain fuels, some of which closely agree, taking the heat of combustion of carbon at 14,400 B.T.U.

Other examples show considerable discrepancy between the two results, which leads to some instructive comments on the subject. The accepted explanation of these differences is the uncertainty that exists as to the effect of the form of the elements on their fuel value. "We do not know in what condition the carbon and the hydrogen exist in coal; and we might go further, and say that we do not know what coal is beyond the probability that it is composed of solid hydrocarbons and not mere mixtures of carbon and hydrogen." This is a pregnant sentence, which coal burners and carbonizers will do well to bear in mind, together with what follows: "Furthermore, it is now recognized that the nature of the hydrocarbons formed from coal under combustion *depends largely upon the temperature*, as also, but in a less degree, upon the size of the particles. Not only is this true, but it is also true that the nature of the carbon resulting from the decomposition of these hydrocarbons swings within relatively wide limits, from loose, flocculent soot to the hard varieties of what is known as deposited carbon." One might infer from this statement that Professor Phillips was once a gas manager, and had knowledge of stopped ascension-pipes!

It is easy to perceive, after this, that the calculated results of the theoretical heating power of coal from its analysis must be taken with a considerable allowance. For this individual cases may show a more or less close approximation to the figures obtained by direct experimental determination, yet the possible, and in many instances the probable, error of the computation method may rise to 15 per cent.

But this is not all. Indeed, it is scarcely to the point at all, so far as the fuel user's interest in the subject is concerned. In comparing one fuel with another, much more has to be regarded than the relative heat units. If this were all, the choice would be a simple matter. There are, however, other and very important considerations involved; and the question of preference is not by any means so simple as it might appear. After the statement that a certain fuel contains so many heat units, there arises the question of their utilization; and herein lies the great and characteristic difference between fuels. The comparison of fuels by means of chemical analysis and computation is entirely proper; but if the investigator stops here, he is very apt to lose sight of the real point at issue, which is their relative efficiency in actual service. There are theoretical reasons for the conclusion that the heat units in one kind of fuel are more efficiently and cheaply available than the heat units in another kind of fuel; and practice bears out this conclusion. The reasons are partly of a chemical and physical, and partly of a mechanical nature—the former being also concerned with questions of composition and physical condition, and the latter with appliances for burning the fuel and saving the heat. The selection between a solid and a liquid or a gaseous fuel is a case in point. There are conditions under which one kind of fuel will be preferable to another. These can be determined only by careful consideration of all the factors entering into the question, and are not based simply on the relation between the numbers of heat units yielded. It is, for example, easy to ascertain that, with a particular boiler burning alternately fuel oil and coal, $4\frac{1}{2}$ barrels of oil do as much work as a ton of coal; but this fact, so simple and clear-cut, does not help the solution of the fuel question very far. Professor Phillips tried to collect information on this head from steam users, and found the oil consumption vary by as much as 43 per cent. Careful tests conducted with Beaumont oil, burnt by means of Williams burners, under return-tube boilers, gave a net evaporation per pound of oil, from and at 212° Fahr., of 15·1 lbs. of feed water. The oil itself weighed 7·66 lbs. per gallon, or 322 lbs. per barrel of 42 gallons (American). The best net evaporative duty of American coals is from $9\frac{1}{2}$ to $10\frac{1}{2}$ lbs. of water per pound.

Among the other auxiliary considerations which need to be taken into account in comparing the evaporative duty of coal and oil, there occurs that of the distribution of the heat produced from the burning of the two kinds of fuel—in other words, their relative efficiency, unit for unit. It is found that the usual effect of oil is 78·5 per cent. in steam raising, as against 71·4 per cent. with coal. Besides this superior efficiency in imparting heat to water, the oil wastes less heat in the shape of the chimney gases. The total superiority of liquid to solid fuel on these accounts may be as much as $21\frac{1}{2}$ per cent. in the case of inferior stoking arrangements. Professor Phillips shrewdly remarks that he has yet to learn how the comparison stands between the most economical use of solid fuel and the ordinary use of liquid fuel, coal being more easily wasted than oil. The question of fuels is a pressing one for Texas, where before 1896 the production of oil did not amount to 100 barrels a year. Up to last March, the production of Beaumont oil has been about 9 million barrels—a wonderful difference. So long as the oil is sold for 20 to 25 cents a barrel, free into tank-cars, there is evidently an active competitor in the local fuel market, even were the freight double the prime cost of the oil.

ELECTRIC LIGHTING MEMORANDA.

An Admitted Scandal—Nemesis Following the Electrical Tout—The Example of Tonbridge.

"MEANWHILE, surely the truth must be dawning upon these representatives of the ratepayers, that they are groping in the dark in undertaking a speculative business for which there is absolutely no sound reason, and which experience has amply proved will, in all probability, result in heavy demands upon the rates." This quotation is not from the "JOURNAL," but from an editorial article in the "Electrical Review" for the 1st inst. It relates to a proposed municipal electricity supply undertaking for serving the Edmonton district, and refers to a reported recommendation of a Committee of the Urban District Council, that the advice of three electrical engineers should be taken before the Electric Lighting Order obtained by the Council this year is proceeded with. If such an observation had appeared in these columns, it would, of course, have been put down to mere trade jealousy. As it happens to be a statement of the ripe wisdom of a leading electrical journal, perhaps it will go home to the perceptions of the ratepayers' representatives concerned as an impartial judgment upon their proposed action. It is no more than we have said here over and over again; and we should be more than human if we could note so strong a confirmation of our long-held and frequently expressed opinion on the subject without feeling more than a tinge of satisfaction. The time was when every project of municipal electricity supply was acclaimed by electricians as good business; but most of the really sound professionals have come to see that this was a mistake. They have arrived at this conclusion by various ways, one of which is the observation that in many cases the "consultants" who cultivate the art of advising small local authorities first to apply for, and then carry out, Electric Lighting Orders, are not altogether worthy representatives of their class.

This is a very delicate aspect of the matter, which we have likewise regarded on many occasions; and we have again the gratification of finding ourselves in line with some of the best opinions of the electrical engineering profession, in holding that in many instances local authorities have been misled by self-styled experts whose advice was utterly unworthy of credit. Here we have it admitted: "The survival of the unfit and the creation of an inferior class of consulting electrical engineers is a phase of municipal trading, the ignorant employers being unable to discriminate in the selection of the men upon whose successful working everything depends." The latter part of the observation appears to apply to the unfortunate central station engineers who come after the consultant, and have to make the best of a bad job. Lieut.-Colonel Crompton has not spoken mincingly about the class of consultants in question, of whom he probably knows much more than it is his business to say in public. The mischief wrought by these bagmen of the electrical profession whom we have been in the habit of describing as "electrical touts," is lasting, many-sided, and almost irremediable except at such a cost as no popularly-elected body likes to incur. Reckoning upon the almost criminal laxity of the Local Government Board and the Board of Trade in permitting small authorities to pledge their rates for wild-cat schemes, these gentry dazzle the locals by their "exhaustive" (stereotyped) preliminary reports, which often pander successfully to the powerful sentiment of parochial vanity, and usually quite win over the local newspaper. The opposition of the few ratepayers who do know something of the subject is overborne; the rest is easy.

Only after the consultant has departed with his commission, does the neighbourhood awaken to the knowledge of how much better it would have been for them if they had refused to have

anything to do with him. Then comes the stage of making the best of a bad job, with the aid of an unhappy station engineer expected to work for next to no salary. The case in point which excited our electrical contemporary to implore the Edmonton Urban District Council to stay their hand, is that of the Tonbridge Urban District Council, who require the services of a station engineer at the munificent salary of £150 a year, all told. The gentleman who wins this prize of the profession must be a fully qualified electrical engineer, with experience of the low-pressure three-wire direct-current system, high-speed engines, accumulators, and triple concentric cables. "As competitors are required to send in copies of three recent testimonials, thorough efficiency is evidently demanded, involving both theoretical and practical training and experience during some years in the school, manufactory, and electric supply works." Prodigious! And it is for the like of this that the avenues to proficiency in electrical engineering are choked, and all the technical teaching and examining organizations of the country are turning out certificated men by hundreds every year. The cream of the joke is in the concession that the chosen of Tonbridge "is to be allowed to take one pupil, who, in exchange for being trained for obtaining a similar prize in the distant future, will be expected to pay in premium some little addition to his mentor's income."

All this constitutes, as our contemporary declares, a scandal which everybody admits. The difficulty is to find a remedy. These petty electricity-supply centres exist, and while they are in being, it is necessary to run them. The consideration that they would never pay well enough to be able to command proper resident skilled supervision does not seem to have occurred to anybody. Several other considerations pertinent to the main issue of successful and satisfactory working were also overlooked; so that too much must not be made of this particular blunder. Local electricity supply does not exist in order that young gentlemen may find genteel occupation in looking after the establishments. If these small works can barely pay for the services of an engine driver or two, one of whom might rank as an engine room and electrical "artificer," let the fact be understood and acted upon. Of course, such berths as are now on offer will find applicants among youthful aspirants seeking a spell of independent employment; but they would never dream of staying in them a day longer than they could help. Whatever might be the value of such "improver's" experience to these young gentlemen, it cannot be the proper treatment of public property to condemn it to transitional and experimental control in perpetuity. By and by, we shall have these small places managed upon the principle of country dentistry practice—the skilled overlooker will have a round, which he will serve from London or the nearest large town. No other solution of the problem appears to be better suited to the conditions.

MODERN USES OF GAS EXPLAINED IN GERMAN.

THE gas consumer who has a general, if not exhaustive, knowledge of the properties and uses of gas is now less rare than he was a few years ago, thanks to the educational influence of the practical demonstrations which abound of the advantages which accrue to him who essays to utilize an adequate share of the energy stored in this marvellously rich and convenient source of light, heat, and power. In other words, everyone who takes the trouble to use gas to the best advantage, for whatever purpose, is rendering a public service, in that by the best of all modes of advertisement he is drawing his neighbour's attention to an agent which is without a serious rival in many of its fields of application. By parity of argument, any book which disseminates a fuller knowledge of the best ways of applying gas at the present day is of real service both to the individual and to the community at large.

Hence we welcome the appearance of the addition to the world-renowned Hartleben's series of manuals which is now before us,* though it can clearly be of little direct service in this country. It is not merely that, to so many of our countrymen, the cumbrous vehicle of intercourse which is fondly regarded as a language by our German brethren, is an impassable barrier, but that simple appliances and means which are common in one country are unknown in the other. Hence descriptions of service in Germany become all but useless here. In regard to incandescent lighting apparatus, this is especially true. A good deal might be quickly gleaned from the little work which would be of utility to those engaged in the lighting and heating appliances industries in this country; but that is a use of his work not contemplated by the author. He set out to compile a manual for popular use; and, so far as German-speaking peoples are concerned, we believe he has fulfilled his object in a very satisfactory manner. The work, however, if translated into English, would be of very little value as a guide to gas consumers in this country, owing to the differences in the customs and appliances. It does not treat of gas manufacture; but many pages, curiously enough, are devoted to details pertaining to main-laying and distribution. It is not obvious what use they will be to the typical gas consumer, for whose benefit, we gather, the book is intended.

*Das Gas und seine moderne Anwendung. Von Paul Frenzel. A. Hartleben (Vienna, Buda-Pesth, and Leipsic 1902.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 415.)

WITH only four days in the middle of it available for business—Monday and Saturday being close holidays—last week could not in any circumstances be expected to be active on the Stock Exchange. But, in addition to holiday influences, the continued apprehension lest more failures were in store as the result of the recent reckless speculation, kept things in an agitated state, and effectually deterred many from dealing at all until the atmosphere should have become clearer. So the week opened heavily enough; and the bad weather assisted to make things gloomier. But before the close, the feeling was to some extent relieved; and the final prices in most departments were above the worst. The Money Market was rather easy at first, but was inclined to harden a little before the close. In the Gas Market, business was only moderate in so far as securities generally were concerned; but in Gaslight and Coke issues there was a good average of transactions. The ordinary stock was dealt in every day at very steady figures, never falling below 91½ or rising above 92¼, which was the closing mark. It must be satisfactory to proprietors to see the price thus keeping up, in spite of discouraging circumstances. But the market rarely looks six months ahead; and "pleased to the last it crops the dainty" dividend, nor troubles too much over impending possibilities. A good deal of business was done in the secured issues; and here too the prices were all very steady. In South Metropolitan, only two or three transactions were marked, but at rising figures. A couple of deals in Commercials, also at good prices, were the sole record. In Suburban and Provincial undertakings there was next to nothing done. Referring to what we said last week as to the first half of 1902 proving favourable to gas companies in general, it is gratifying to find that the latest issued accounts quite confirm this impression. And coupled with these, come announcements of increased dividends. South Metropolitan will advance from a 5 per cent. rate to 5¼ per cent. Commercial will advance from 12 per cent. on the old stock and 9 per cent. on the new stock, to 12½ and 9⅜ per cent. respectively. Tottenham and Edmonton will advance from 5½ per cent. on the "A" stock and 4 per cent. on the "B" stock, to 6 and 4½ per cent. respectively. Several other undertakings show a nice growth in their business, though they do not increase their rates of dividend. Turning to the Continental Companies, all were very quiet; but Imperial marked high prices, and looked like making an advance. None of the remoter undertakings showed any feature calling for comment. The Water Companies continue stagnant, and are not likely to show much animation before October, when Parliament will reassemble and continue to discuss the Water Bill.

Not one single quotation was changed last week. We believe this entire absence of change is unprecedented since our Stock and Share List began its issue, some twenty years ago.

PERSONAL.

Mr. G. MAYNE has just taken up his duties as Manager of the Etwall Gas-Works, near Derby.

The Directors of the Rhymney and Aber Valleys Gas and Water Company have appointed Mr. C. JONES to be Manager of their Hengoed gas and water works.

Mr. J. O'GRADY, who has for some years been with the Alliance and Dublin Consumers' Gas Company, has now been appointed Manager of the Killarney Gas-Works.

The position of Superintendent of the Gas Street station of the Bolton Corporation, rendered vacant by the death of Mr. J. Lawton, has been filled by the appointment of Mr. A. E. SAVILLE, formerly Manager of the Holyhead Gas-Works.

Mr. D. VASS, the Engineer and Manager of the Airdrie Gas-Works, was married at Greenock on the 30th ult. to Miss Dunlop King, of Greenock. Mr. W. MARSHALL, the Manager of the Banff Gas Company, was married the same day to Miss Mary Selina Thorogood, of Banff.

Mr. O. B. STEWARD has been appointed Clerk to the Derwent Valley Water Board, in succession to Mr. James Bell, who held the office, in conjunction with that of Town Clerk of Leicester, until his appointment recently as Town Clerk of the City of London. Mr. Steward was Assistant Solicitor and Clerk to the Board under Mr. Bell; and he will now give his full time to the duties of the office.

When noticing, in the "JOURNAL" for the 1st ult., the decision of the Trustees of the Stevens Institute of Technology, Hoboken, to offer the presidency to Mr. A. C. HUMPHREYS, of Messrs. Humphreys and Glasgow, in succession to the late Dr. Henry Morton, it was stated that, though he had not formally accepted the position, there was no reason for doubting that he would do so. We learn from the "American Gaslight Journal" that he will take up the work carried on so successfully by his distinguished predecessor, but that he will continue his active business relations with his firm.

Mr. MATT. DUNN, of Goole, has been successful in obtaining the appointment of Assistant-Manager at the Stockton-on-Tees

Gas-Works, in spite of the fact that the Gas Committee recommended Mr. Richard Brown, late of Cambridge, for the post. When the Committee's recommendation in favour of the latter gentleman came before the Council, Mr. Meggeson moved, as an amendment, that the name of Mr. Dunn be substituted, urging that his local knowledge, and his former association with the gas-works, rendered him a more suitable man for the position. After some discussion, the amendment was carried by 16 votes to 10; and a further amendment that the whole matter should be referred back to the Committee was lost—only five members voting for it. While congratulating Mr. Dunn on his success, we cannot refrain from expressing our sympathy with Mr. Brown in the exceptionally hard luck which has fallen to his lot.

NOTES.

Measuring the Distribution of Illumination in a Room without the Intervention of a Standard Light.

Herr J. Classen described, in a recent number of the "Physikalische Zeitschrift," a photometrical apparatus for this purpose, which is constructed as follows: Two white screens, which can be pushed along wooden scales 3 ft. 3 in. long, can be rotated with the scales round a horizontal axis, and be brought into different places in the room in which the brightness of illumination of surfaces is to be compared. The two screens are observed through a pair of Lummer-Brodhun prisms on the horizontal axis; and by means of two Nicol's prisms, that which is most brightly illuminated is made equal to the other as nearly as possible. A smoked glass is used to compensate for the loss of light in the Nicol's prisms.

The Kroecker Calorimeter.

In a recent issue of "La Chimica Industriale," an account was given of some tests of the heating power of coal gas carried out with the Kroecker calorimeter, in the laboratory of the Royal School of Applications for Engineers at Turin; the investigators being Signori Morelli and Colonne. They commenced working with the Mahler bomb, and though the results obtained with Italian gas agreed fairly well with those arrived at by Mahler himself with Paris gas and Commentry anthracite, they found that the bomb was not altogether suitable for their purpose, from the fact that there was only one communication with the interior, so that the operation of filling the instrument with gas was long and tedious. This inconvenience was remedied by using the improved calorimeter of Krœcker, which has two inlet-pipes. It was constructed originally to determine the heating power of solids only; but in the opinion of the above-named gentlemen it is equally suitable for gaseous fuels. A defect is the small capacity of the cylinder—about 300 cubic centimetres—compared with that of the Mahler bomb, which is 650 cubic centimetres; while it has only a wooden cover, whereas the bomb is well protected from the effects of outside temperature.

A Riveted Steel Force Main.

A 30-inch riveted steel force main, laid last summer to supplement the water supply of Atlantic City (N. J.), is described in the 1901 report of Mr. W. C. Hawley, the Superintendent. From particulars contained in the "Engineering Record," the method of coating the pipe is of special interest, on account of the corrosive action of the meadow mud in which part of it was to be laid. Each length was made up of five alternate inside and outside rings of ¼-inch open-hearth steel, the diameter of the inside rings being 30 inches and the total length of the section being 28 feet from centre to centre of the rivet-holes. After riveting and calking the seams inside and out, the pipe was heated by a jet of natural gas, burned inside, to a temperature of about 400° Fahr. and then coated by dipping it into a bath of mineral rubber heated to the same temperature. The pipe was lifted out of the bath slowly, so that the surplus coating material would run off, and it was then placed on end inside a frame scaffold, and two strips of 10-oz. burlap wide enough to encircle the pipe and overlap a few inches were applied immediately by a gang of paper hangers, and brushed into the hot coating. In laying the pipe across the meadows, branches were inserted at six points to connect to the two old mains, allowance being made for expansion and contraction by slip joints inserted on either side. A 30-inch Venturi meter was set near the pumping-station, in order to give a more accurate record of the quantity of water pumped than could be obtained from the revolution counters on the pumps, as was done in the past. A 20-inch Venturi meter at the other end of the main gave a check on any leakage. The valves on the three mains were so placed that any one could be repaired without shutting off more than one section of one of the mains.

The Strength of Reinforced Concrete.

Professor W. K. Hatt, of Purdue University, U.S.A., has organized in that institution a series of tests of the strength of reinforced concrete beams, as a thesis exercise for the senior students in the Department of Civil Engineering. It was a long and difficult undertaking, and the results, as set out at length in a paper reported in the "Engineering Record," are not of commanding significance. Nevertheless the investigation was a useful exercise for the students, comprising as it did determinations of the moduli of elasticity and strength, in tension and compression, of the broken stone concrete, the strength of the cement in tension and compression, the elastic limit and modulus of electricity of the iron, analysis of the sand and stone, and tests of the adhesion between the iron and the concrete. A theory of the strength of reinforced concrete has been promulgated by M. Considère; and there was about 8 per cent. difference between the indications of the theory and the results of experience. It was ascertained, among other things, that a cinder concrete beam is only half as strong as a stone concrete beam, when both are reinforced with 2 per cent. (of the area of cross section) of metal 1 inch from the bottom face. It appears that reinforcing a beam with even one per cent. of steel gives it ten times its former flexibility, and more than three times its former strength. Moreover, a reinforced concrete beam when it does break, breaks differently from a beam of plain concrete. The effect of the reinforcement probably is to distribute the elongation which precedes rupture over the whole length of the strained part, instead of allowing it to be confined to the fractured section. Plain concrete practically has no extension; the figure of 1 : 10,000 assigned by M. Considère to this factor being valueless. On the contrary, reinforced concrete shows an extensibility of 1 : 1140, which is as much as is needed for a material used in this way.

Oil Burning in a Closed Furnace.

A good deal of activity is being manifested on the part of mechanical engineers interested in appliances for the consumption of oil as fuel. During the past few years, Mr. Charles E. Lucke has conducted a system of experiments with oil-burners at the Columbia University; and a paper giving the results obtained was presented by Mr. R. H. Fernald at the last meeting of the American Society of Mechanical Engineers. Upon his experiences with these appliances, Mr. Lucke has based a very simple and effective arrangement, which was finally adopted. Instead of vapourizing or spraying the oil into the furnace by any mechanical means, Mr. Lucke delivers the liquid fuel directly into the mass of a body of broken refractory stone (magnesite) which has previously been raised to a red heat by means of a gas-flame. The hot stones vaporize the oil, which burns as a gas. In describing his method, Mr. Lucke says: "The air and oil impinge together on the hot mass, spreading out in constant velocity surfaces. The combustion takes place on the surface where the velocity is equal to the rate of propagation." The fire is described as being of an explosive character; it is designated an "explosive oil fire." Apparently, this is done by proportioning the quantity of air to that of the oil; but the language of the inventor is not very plain. It is claimed that with every oil tried the action was the same. Three fires, side by side, burning respectively kerosene, cylinder oil, and linseed oil, did not differ in effect. In the original experiments, fire-brick was used; but the intense heat of the fire fused the fragments together, and better results were obtained with magnesite. Although this method of burning liquid fuel is applicable to every kind of furnace, the designer's principal object was to arrive at direct combustion for use in constructing an internal-combustion engine working by increase of volume at constant pressure. By properly proportioning the air and the liquid fuel, and supplying the mixture continuously under pressure, it is possible to continuously maintain combustion in a closed vessel.

Ammonia in Water.—In a recent number of the "Berichte," Herr Emmerling pointed out that in determining the ammonia in water by Nessler's reagent, this is often added directly to the water, without first distilling. This method may lead to error, if albuminous substances be present in any quantity, which may be the case with sewage rich in organic matter. Small quantities of peptone, albumin, or glue entirely prevent Nessler's reagent from giving a coloration with water containing 0·001 gramme of ammonia in 100 c.c. In the case of highly contaminated waters, distillation with caustic soda, or better with magnesia, is therefore essential. The author has used lead hydroxide with success in place of magnesia.

Nitrogen in Water.—The determination of organic nitrogen in water was dealt with by M. Causse in a recent number of the "Comptes Rendus." As a substitute for the albuminoid ammonia process, the author uses the following: To the water add, for each litre, 25 c.c. of saturated baryta water containing 20 per cent. of barium chloride, close the flask, and let it stand for 24 hours. Collect and wash the precipitate, place in a flask, treat for from 20 to 25 minutes on the water-bath with twice its volume of 10 per cent. potassium carbonate solution, decant off the solution through a filter, repeat the treatment of the precipitate with half the former quantity of potassium carbonate solution, filter, and wash. To the united filtrates add sulphuric acid till strongly acid, and evaporate. Transfer the dry residue to a small flask, and heat with 5 c.c. of concentrated sulphuric acid till the organic matter is completely destroyed. After cooling, add 100 c.c. of distilled water, boil off any sulphur dioxide, cool, add phenolphthaleïn and potash till in slight excess, make up to 200 c.c., and distil. Collect from 25 to 30 c.c., cool, distil another 25 to 30 c.c., unite the two distillates, and Nesslerize.

TECHNICAL RECORD.

PHOTOMETRIC WORK AT CHARLOTTENBURG IMPERIAL INSTITUTE IN 1901.

The report of the Imperial Physical-Technical Institute at Charlottenburg for the year 1901 contains the following references to the certification of photometric apparatus, &c.

During the year, 137 Hefner lamps were certified, including 50 with sighting pieces, 60 with optical flame measurers, 10 with optical flame measurers and sighting pieces, 11 with optical flame measurers and compensating wick tubes, 6 with sighting pieces, optical flame measurers, and compensating wick tubes. (Since the introduction of certification in 1893, there have been certified 247 Hefner lamps with sighting pieces, 508 with optical flame measurers, and 103 with both flame measurers; making a total of 858 Hefner lamps.) There were also received for testing in 1901, 359 electric incandescent lamps with carbon filaments, including 44 for durability tests, 22 osmium lamps, 2 arc lamps on the Bremer system, 1 arc-lamp carbon, 180 incandescent gas lighting apparatus (of which 130 were for durability tests), 4 incandescent gas lamp supports, 5 mercury high-pressure gas apparatus, 5 Lucas and similar lamps, 2 Scott-Snell lamps, 2 incandescent acetylene lamps, 5 petroleum testers, 7 incandescent petroleum lamps, 1 incandescent spirit lamp, and 1 benzoline lamp.

With regard to the high-power incandescent gas-burners, it is stated that some of them were like the ordinary burners in construction, but instead of using mantles about $2\frac{3}{4}$ inches long, they had mantles from 4 to $5\frac{1}{2}$ inches long. They were mostly provided with chimneys with lateral holes. The power of the light was 130 to 220 candles, and the hourly consumption of gas 7 to 14 cubic feet. These burners were therefore no more economical than ordinary incandescent gas-burners. In other types, a new principle of construction had been introduced with a view to obtaining a more powerful light. Among them are the lamps known as the "Mercury," which are fed by a high-pressure gas apparatus, driven by an electric motor. In the Lucas lamps, the air for supporting combustion is drawn in by a strong draught, produced by a long chimney placed over the burner. The Scott-Snell lamp has a special pumping arrangement for this purpose. The illuminating power of these lamps was between 175 and 525 candles, and the hourly gas consumption between 8·8 and 22·2 cubic feet. The testing of mantles which are on the market, was carried out in conjunction with the German Association of Gas and Water Engineers. Six kinds were examined. They showed an average light of 61 candles for a period of 300 hours. The diminution in the light in this time was 39 per cent., and the average light obtained per cubic foot of gas ranged from $16\frac{1}{2}$ to 31 candles. The Imperial Institute also gives notice that in future, in place of the designation "Hefner light," it will adopt the term "Hefner candle" (Hefnerkerze), and the abbreviation HK, as accepted by the German Association of Gas and Water Engineers and the Society of German Electricians.

PUBLIC SUPPLIES OF SIMPLE WATER GAS.

We have received a copy of the report for the year 1901 on the results of the working of the Municipal Water-Gas Works at Pettau, a small town in Styria. The plant is on the Strache system; and the gas is supplied without being carburetted. The total make during the year was about 4,580,000 cubic feet; but of this quantity about 440,000 cubic feet was consumed in the gas-engine used for driving the fan for the air-blast; and hence there was only about 4,140,000 cubic feet distributed for public consumption. The maximum day's output was 25,040 cubic feet, on Dec. 17. The fuel used in the generator was Wieser lignite or brown coal, to which 7·54 per cent., on the average, of coke was added. In addition, 220 lbs. of coke were used each day to get up the heats before starting gas making.

The generator lignite cost, on the average, nearly 16s., and the coke £1 10s. 5d. per ton; while inferior lignite, used as boiler fuel, cost 8s. 1d. per ton. This boiler fuel was reckoned to produce 4 lbs. of steam per pound consumed. The cost per 1000 cubic feet, of the several items in the total manufacturing cost of the water gas distributed averaged as follows: Boiler fuel, 0·77d.; coke for raising heats at start 3·15d.; lignite and coke subsequently used in generator, 7·49d.; odorizing the gas and removing iron carbonyl, 0·91d.; purifying materials, 0·12d.; lubricating material, 0·21d.; sundry items, 1·15d.; wages, 3·97d. (the foreman in charge gave part of his time to other municipal work, so a portion only of his wages was charged to the gas-works); and repairs, 0·42d.

The total cost of producing 1000 cubic feet of water gas for distribution was therefore 18·19d., to which must be added interest and depreciation charges amounting to 25·69d.; making the grand total of 43·88d., or nearly 3s. 8d., per 1000 cubic feet. On the other hand, the receipts for gas sold for private and public lighting, &c., averaged 59·20d. per 1000 cubic feet; giving a profit balance of 15·32d. per 1000 cubic feet. This was independent of meter-rents, profit on the sale of burners, fittings, &c. There were 193 private consumers, and 1329 burners, including street-lamps, were supplied, in addition to 3 gas-engines, 3 gas-fires, 13 cookers, and some gas-irons. The consumption showed a considerable increase over that of the preceding year; but owing to a great reduction in the quantity of unaccounted-for gas, the make was considerably less than in 1900. The length of distributing mains was increased by 1970 feet during the year.

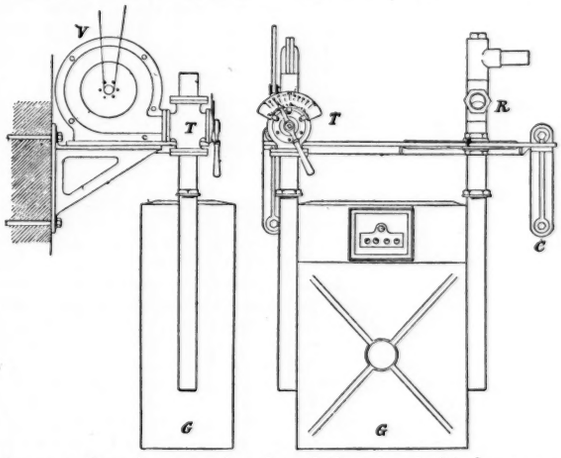
The small town of Radkersburg in Styria has also had a Strache water-gas plant in operation since November, 1901, when it superseded a water-gas plant of another type, which had proved unsatisfactory during the previous four years in respect of fuel consumption. The consumption of coke in the generator of the old plant amounted to $115\frac{1}{2}$ lbs. per 1000 cubic feet of gas made; while the Strache plant was guaranteed to consume only $31\frac{1}{4}$ lbs. per 1000 cubic feet.

CONTINUOUS ADMISSION OF AIR TO OXIDE PURIFIERS.

The following particulars from a communication by Dr. J. Becker, Chemist to the Frankfort Gas Company, to the "Journal für Gasbeleuchtung," supplement Herr Breitkopf's recent paper on "Continuous Revivification of Oxide in Small Gas-Works," a translation of which has already appeared (*ante* p. 215).

Dr. Becker says that, from his own experience, he can confirm the favourable results stated to be obtained from the practice of adding air to illuminating gas. Various types of apparatus have been introduced for the purpose. Herr Breitkopf has mentioned one made by the firm of Klempt and Bonnet, of Duisberg, which is very simple and reliable in working. Dr. Becker has seen it in use at various works, and has heard favourable reports of it everywhere.

The apparatus consists of a blower V, the air-regulating valve T, the gas or air meter G, and the shut-off cock R. The blower is best coupled to the shaft which drives the exhauster, as thus more or less air is admitted, corresponding to the quantity of gas pumped by the exhauster. The stream of air sucked in by the blower passes to the air-meter G, through the distributing cock T, and is admitted to the gas, which is still hot, through the return-valve R. The crude gas must be hot, as it is well-known that air when added to the warm gas is more fully carburetted than when the gas is cold. The distributing cock T has to be set so that 1 or 2 per cent. of air, calculated on the daily production in cubic feet per hour or quarter hour, passes through the air-meter.



The quantity of gas produced, and the air admitted, are read off every quarter-of-an-hour, and the lever is set so that exactly 1 or 2 per cent. of air is admitted. This setting has only to be done once, and the workman soon learns at what position the cock T has to be for a certain hourly production of gas. A glance at the return-valve R, according as it is opened wide or not, will show approximately the air admitted. If too much air is being admitted, the distributing valve T lets it escape into the open. The latter is made so that the section of the through-way is not diminished in whatever position the valve is placed. The bye-pass valve R, fixed behind the air-meter, opens and closes with ordinary pressure. If, through some interruption in the working of the exhauster, the gas pressure rises in the main, the valve closes, so that no gas can escape. The total quantity of air admitted daily is best controlled by entering in a book every hour the readings of the air-meter. The calculation of the proportion from the meter, and the setting accordingly, are, however, only necessary when the apparatus is first started.

Dr. Becker hopes later to report more in detail on the proportion of the oxygen of the admitted air which is combined in the purifiers, as well as on the rise in temperature in the vessels consequent on the addition of air.

THE "DUPLEX" GAS-METER.

In the general notice of the proceedings at the congress of the Société Technique in Paris which appeared in the "JOURNAL" for June 24, reference was made to a paper in which was described a new form of gas-meter, with balanced drum, of which a full-size working model was shown. The author was M. Foiret, who is well known in Paris from his connection with the Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz; and it is to his ingenuity that this departure in meter construction is due. The following is an abstract of the paper.

It has been generally admitted that the normal rate of speed of the measuring part of a meter—that is to say, the number of revolutions the drum can perform, without inconvenience, from the point of view of regular working, accuracy of measurement, and absorption of pressure—should be 100 revolutions per hour for all diameters. This is an empirical rule which has hitherto been accepted by all meter makers; but it is one which is not based upon any scientific foundation. In fact, the resistance presented by the water to the rotary movement of the vanes augments very rapidly with their circumferential speed; and therefore it seems more logical to admit that the normal speed, instead of being uniform for all meters, should vary in inverse ratio to their dimensions, at all events from a certain diameter. Practice, moreover, demonstrates that, in some capacities, the speed of 100 revolutions is incompatible with regular running. This has led to the adoption of a much lower speed for station meters—75 to 80 revolutions for a delivery of $1\frac{3}{4}$ million cubic feet per 24 hours, and about 60 revolutions for $3\frac{1}{2}$ millions.

This question of the speed at which meters should work does not seem to have ever been the subject of special study. The only object of the successive modifications and improvements effected in the drum has been to ensure the accuracy of the meter as a measuring instrument. But no alteration appears to have dealt with its structure. This the author regarded as a want to be supplied; and he accordingly came to the conclusion that an interesting problem might be thus enunciated for solution: Proportion the speed of drums to their diameter according to the dimensions, and increase their speed so as to obtain a better utilization of the apparatus. In fact, any acceleration of speed realized without compromising the satisfactory working of meters would make it possible to reduce their dimensions, and should for this reason be regarded as an important improvement. He consequently undertook a series of experiments which resulted in the invention of the new type of drum to which he had given the name of "Duplex."

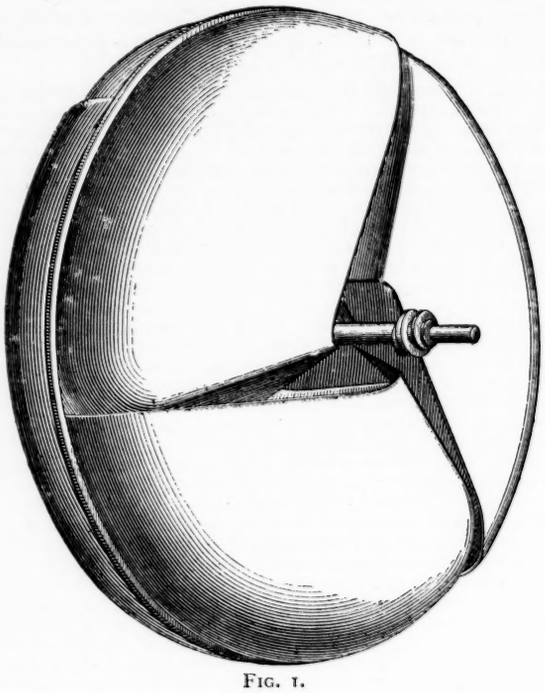


FIG. 1.

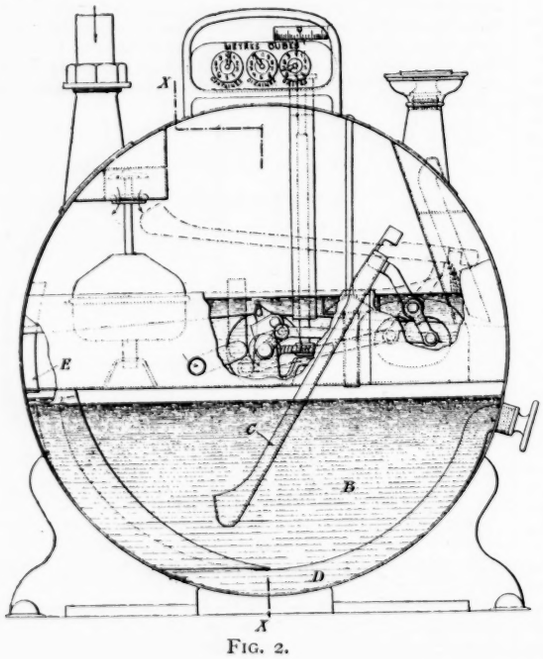


FIG. 2.

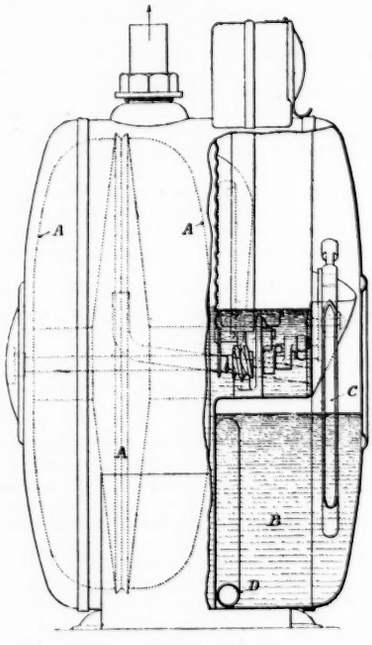


FIG. 3.

It will be seen by the accompanying illustration (fig. 1) that the drum exteriorily has the form of a flattened sphere. It is composed of six parts, made by stamping, and connected together in two symmetric series, with a free space between them acting as a central distribution chamber for the admission of the gas into the measuring compartments. This space corresponds to the "hood" of the ordinary drum. The parts are put together on a common junction line representing the meridian of the sphere, so that a single welding or riveting suffices to unite all the constituent parts of the drum. It is at once easy to see that the advantage of this arrangement is to balance the drum in every position, and nullify, by opposing them one to the other, the longitudinal pressures upon the axis, which reduces friction on the bearings. Moreover, the form given to the new drum considerably decreases the surfaces of the helices at their circumference—*i.e.*, at the very part where, owing to the great speed of the vanes, the water presents most resistance to their motion. The vanes are arranged quite differently from those in ordinary drums, which are formed of simple flat partitions with sharp angles presenting the inconvenience of agitating the water and causing eddies, especially in large meters. In the "Duplex," they are almost parallel to the axis in the central part of the drum, to allow the water to flow easily from one compartment to another; and they rise gradually in a curved surface on this axis, until almost perpendicular with it at the circumference. As the result of these special arrangements, the speed of the new drum may be varied considerably, and may greatly exceed that of other drums without detriment to accuracy of measurement and without absorbing more pressure. This property is an important one, as it renders it possible to measure large volumes of gas with meters of comparatively small dimensions. The diagram fig. 4 shows that it is possible to obtain a delivery of from 420,000 to

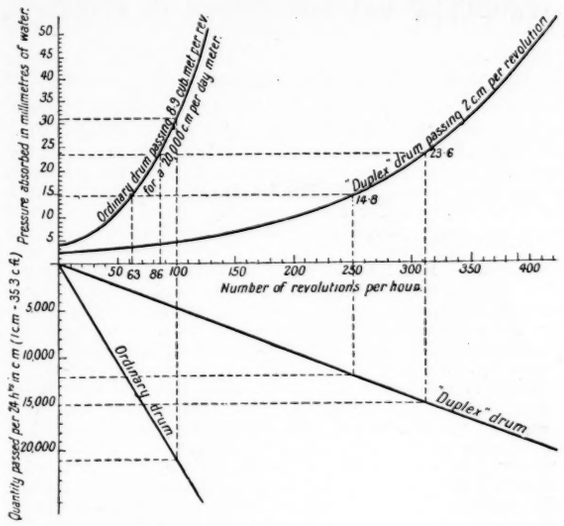

Pressure absorbed in millimetres of water.
Ordinary drum passing 6·3 cub. feet per rev. for a "Duplex" drum passing 2 c.m. per revolution
"Duplex" drum passing 2 c.m per revolution
Number of revolutions per hour.
Quantity passed per 24 h^rs in c.m (1 c.m. = 35·3 c.ft.)
Ordinary drum
"Duplex" drum

FIG. 4.

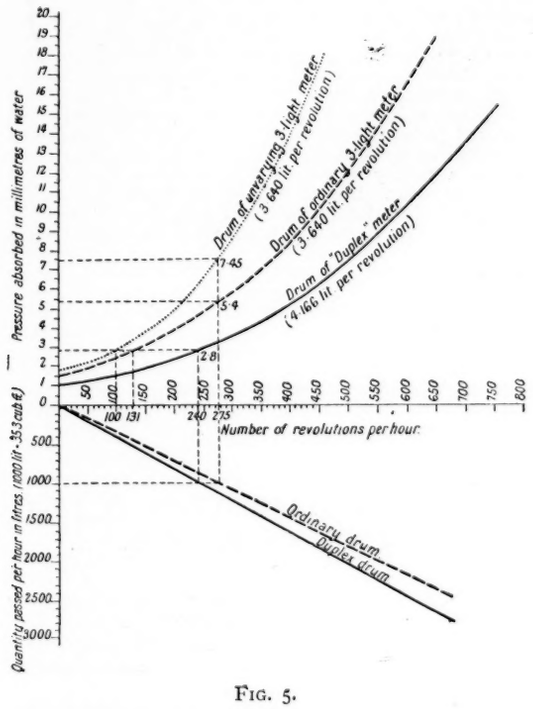

Pressure absorbed in millimetres of water
Drum of unvarying 3-light meter (3 640 lit. per revolution)
Drum of ordinary 3-light meter (3 640 lit. per revolution)
Drum of "Duplex" meter (4 166 lit. per revolution)
Number of revolutions per hour.
Quantity passed per hour in litres (1000 lit. = 35·3 cub. ft.)
Ordinary drum
"Duplex" drum

FIG. 5.

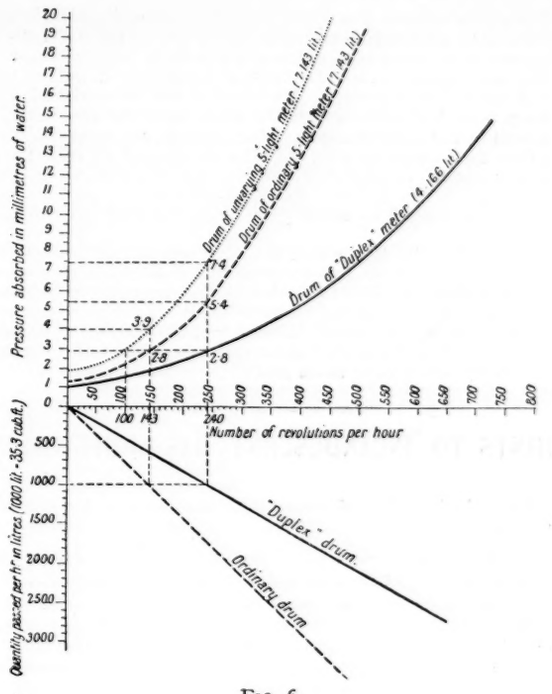

Pressure absorbed in millimetres of water
Drum of unvarying 5-light meter (7 143 lit.)
Drum of ordinary 5-light meter (7 143 lit.)
Drum of "Duplex" meter (4 166 lit.)
Number of revolutions per hour
Quantity passed per h^r in litres (1000 lit. = 35·3 cubic ft.)
"Duplex" drum.
Ordinary drum

FIG. 6.

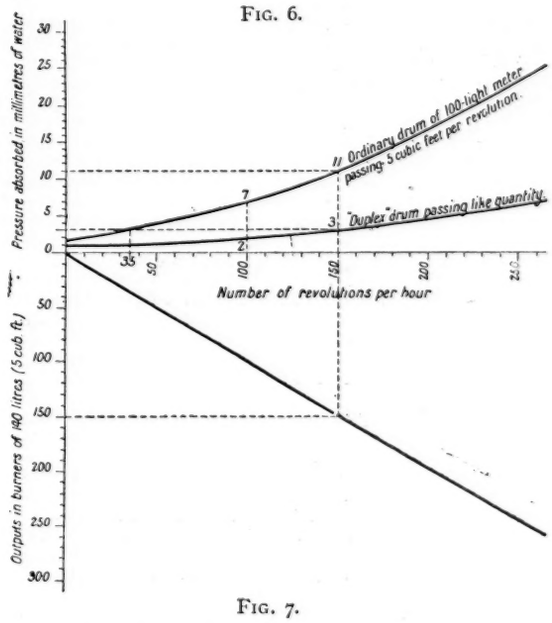

Pressure absorbed in millimetres of water
// Ordinary drum of 100-light meter passing 5 cubic feet per revolution.
"Duplex" drum passing like quantity.
Number of revolutions per hour
Outputs in burners of 140 litres (5 cub. ft.)

FIG. 7.

50,000 cubic feet per 24 hours from a meter furnished with the "Duplex" drum having a capacity of 70 cubic feet, and running at the rate of 250 to 315 revolutions per hour. The same diagram gives, by way of comparison, the pressure-absorption curve of a meter of the ordinary kind passing 706,000 cubic feet per day; and it shows that the speed of 100 revolutions per hour should in this case be considered as the maximum limit. There is no reason to fear that increase of speed will cause rapid wear, inasmuch as, compared with the ordinary drum, the weight of the "Duplex" is reduced in the same proportions as the speed is increased; while as regards friction, the old and new types are about on a par.

The advantages of this meter, not only from the point of view of increased speed, but also of regularity of working, led the designer to apply the principle to consumers' meters. A meter of this type is shown in figs. 2 and 3; the former being a sectional elevation, and the latter a transverse section on the line X of fig. 2. In the construction of this meter, certain precautions had to be taken. Being of reduced capacity, partial evaporation of the water might be expected to cause the meter to register inaccurately. An unvarying level was therefore ensured by means of a small reservoir, the water in which is raised by a special scoop. This system, which has been in use in England for more than thirty years, possesses the great advantage of obviating the frequent adjustment of the water-level, and avoiding the sensitiveness of the valve often noticed in meters, especially since the use of high-power burners, cooking and heating stoves, gas-engines, bath-heaters, &c., has become general. In a "Duplex" meter of the smallest type, this reservoir will hold about 4 pints of water, which is quite sufficient for several months' work. This would allow of a reduction in the staff of meter inspectors.

Referring to the two diagrams showing the construction of the meter, A is the drum, B the water reservoir, C the scoop, D an overflow pipe, and E a small tube establishing communication between the overflow-pipe and the measured gas. The two diagrams figs. 5 and 6 are curves showing the pressure absorbed respectively by a "Duplex" drum passing 1000 litres (35·3 cubic feet) per hour, and the drums of ordinary and unvarying water-line 3-light and 5-light meters. Fig. 7 gives curves of the comparative absorptions of pressure by the drum of an ordinary meter passing 5 cubic feet of gas per revolution, and a "Duplex" drum of like capacity.

In addition to the advantages already noticed, the "Duplex" meter has certain improved arrangements for preventing fraud. The water inlet and outlet orifices can only be made to furnish a supply of gas from the outlet-pipe of the meter—that is to say, gas which has been measured—assuming, of course, that the hydraulic seals of these orifices have been broken.

The author concluded by expressing the opinion that, as a consequence of the almost general adoption of incandescent burners, and the gradual extension of the use of appliances for cooking and heating and the production of motive power, it would be advisable to give up the practice of indicating the capacity of meters by the number of 5-feet burners they are capable of serving. However logical this method of designating their capacity might have been in the early years of the gas industry, when the

fishtail burner was practically the only one employed, it is inapplicable to the conditions under which gas is consumed to-day, inasmuch as many meters have not only to supply burners of different capacities, but also heating appliances of various kinds and engines of all powers. It seemed to him far more rational to adopt a fresh classification, based solely upon the quantity of gas passed by the meter per hour. For example, the present series of 5-light to 200-light meters, might be designated by their normal hourly output in litres, as follows: No, 1, 1000; No. 2, 2000; No. 3, 4000; No. 5, 8000; No. 6, 16,000; No. 7, 32,000. These would correspond to about 35, 70, 140, 280, and 560 cubic feet per hour.

It only remains to say that the diagrams and the lines accompanying them show the construction and capabilities of the meter sufficiently well to render further remarks unnecessary. With regard to the special feature—the drum—the curves furnish evidence that, with equal delivery and absorption of pressure, the speed of the "Duplex" meter may, according to the capacity, be twice or even three times that of an ordinary meter.

HINTS TO INCANDESCENT GAS-LIGHT USERS.

In an Address to a Meeting of the Mid-Rhenish Association of Gas and Water Engineers, Herr Volk, the Works Manager of the German Welsbach Light Company at Berlin, gave a number of hints on the fitting and use of incandescent gas-burners, of which the following is an epitome.

Now that incandescent lighting has come into almost universal use, people have gradually awakened to the fact that it is not always advisable simply to place Welsbach burners on existing fittings which were used for burners of 15 to 17 candle power. A powerful light can be most economically used by employing specially constructed fittings. It has, for instance, been the practice in street lighting to fit incandescent burners in place of ordinary burners without altering lamp-posts, brackets, &c., or providing for a greater distance from one light to another. For lighting factories, the Welsbach light has, under such conditions, in many cases been actually harmful, as the intense light has dazzled the eyes, and the natural consequence has been that means have been employed which rendered the advantages of incandescent lighting very questionable. It is frequently the case in factories that the good effect of the light is much impaired by the use of unsuitable obscuring or screening arrangements. To light a factory advantageously, the nature of the business must be taken into account. In engineering shops with lathes, planing machines, &c., it is best to have a general light as close to the roof as possible; thus giving, as nearly as may be, the effect of daylight. By judicious distribution of groups of burners, shadows can be almost entirely avoided. For work of greater precision, a device to take the place of the ordinary wall bracket or pendant is most suitable.

Experience has shown that most mantles are destroyed while not in actual use for lighting. Workmen, following their old habits, hang small tools, &c., on the brackets; and the mantles are destroyed by the unavoidable shaking which then occurs. For this reason, a new and moveable wall-bracket pendant lamp, which can be drawn up out of reach when not in use, is to be recommended. While in use, it can be drawn down near the work; and the opaque screen with which the burner is provided affords an effective protection against dazzling. The source of light being so near to the work also effects a great saving in gas, as smaller burners can be used. For large buildings, such as gymnasiums, &c., the employment of groups of burners is preferable. For rooms used for teaching drawing from models, &c., a light giving a uniform shade effect is best. For this purpose a number of burners united in a group, with a specially constructed reflector on the wall between the windows, is employed.

The need of governors has lately been brought into prominence. This is most simply met by using the well-known regulating nozzles, by which the gas consumption can be regulated while the burners are in use. Governors inserted in the pipes near the meter will not answer under all conditions. Care is necessary in using many of them, as explosions due to their failure have lately occurred. With governors attached to each burner an explosion need not be feared. The latter have not come much into use, because, as at present constructed, they require the burner to be raised, and this has a disturbing effect. In order not to impair the proper admixture of the gas with the atmospheric air in the burner, care must be taken when using burner governors that a diminution of the gas pressure does not ensue anterior to the gas outlet in the burner-tube. This is effected by putting a burner having gas exit orifices corresponding to the governor on to a governor set for the proper consumption.

In respect of the six months ending the 30th of June, the Directors of the Commercial Gas Company will recommend dividends at the rate of 12½ per cent. per annum on the old, and 9½ per cent. per annum on the new stock, at the forthcoming half-yearly meeting.

PRODUCER GAS FOR POWER IN ITALY.

The increasing popularity of "poor" gas for driving engines in Italy is shown by some particulars recently given in "Industria" in regard to plant constructed by leading firms in that country. The latest engines of MM. Langen and Wolff, of Milan, do not differ materially from those supplied four years ago, except in the adoption of the Hartung governor and the Dowson gas-producer. The firm have, however, introduced a new type of plant, in which there is neither a boiler nor a gasholder. The gas is sucked directly into the engine, as in the Bénier and Taylor types; the necessary steam being generated by a set of Field tubes near the producer. The Bitonto plant of the Neapolitan Electric Light Company was originally designed by the late Società Luce e Forza of Turin, and it was to consist of a producer for 250-horse power and two engines of 75-horse power each. But before the engines could get to work, a third engine of 85-horse power had to be put up, owing to the increased consumption of current; so that there is now 235-horse power. The two 75-horse power engines perform 190 revolutions per minute and the other engine only 160 revolutions; the dynamos being driven by a belt. The gas-producer has two generators, one of which is kept in reserve. As water is very scarce at Bitonto, it was necessary to construct a special appliance to cool the hot water circulating in the engines. This economizer reduces the consumption of cooling water to from 1 to 2 litres (1¼ to 3½ pints) per effective horse-power-hour; otherwise it would be from 35 to 40 litres (62 to 70 pints). The Neapolitan Company have also in use three engines of 60-horse power at Terlizzi, and two of 50-horse power at Bisceglia; bringing up to 500-horse power the total "poor" gas power employed at the three stations. Plant has also been erected at Civita Vecchia, in the works of the Società anonima Fabrica di Calce e Cementi of Casale Monferrato. The first installation, constructed during the year 1896, consisted of a 150-horse power producer and a reserve producer with two Otto motors of 70-horse power each. These are single-cylinder engines, and drive, by belts, the main transmission gear, which is placed in a gallery about 6 ft. 6 in. below the level of the engine-room floor. Encouraged by the results realized by this plant, the manufacturers increased it in 1900 by adopting purifiers, and utilizing the reserve producer of the original plant. The capacity of the generator can be increased to 300-horse power, and a new double-cylinder gas-engine of 160-horse power has been installed. Both the latter and the 70-horse power engines perform 180 revolutions per minute, and are capable of furnishing power, on the brake, at least 10 per cent. greater than the nominal. The engines are started automatically by means of compressed air. The figures for the consumption of coal and coke, according to Signor Bonelli, who constructed the first section of the plant, are 0·515 kilogramme per effective horse-power-hour, with a maximum of 85-horse power given by one of the engines.

CAUSE OF THE RAPID DIMINUTION IN LIGHT FROM WELSBACH BURNERS.

The following is the substance of a paper read by Herr G. Wobbe, the Manager of the Municipal Gas-Works at Vienna, before the annual meeting of the Austro-Hungarian Gas Association on the 27th May last. The paper was given in full in a recent number of "Der Gastechniker."

Every flame, as is well known, consists of three parts, divided by Berzelius as follows: (1) The non-luminous part or core; (2) the coating surrounding the core; and (3) the outer mantle, in which the hottest zone of combustion is formed. To obtain the greatest possible lighting effect with the incandescent burner, the Welsbach mantle must coincide with the hottest zone of combustion. An attempt is made to obtain this object by regulating the supply of gas by means of the gas-tap, or by a governor inserted before the burner. When the supply is regulated by the tap, the gas passes more slowly through the pipe from the tap up to the burner, while at the same time there is a decrease in pressure. Thus the *vis viva* of the outflowing gas is diminished, so that at the outlet it is no longer able to cause the formation of a thorough mixture of gas and air. When the supply is regulated by a governor, it is certainly possible to furnish a certain gaseous mixture to the flame; but the governor can only be approximately set, so that generally the mantle and the hottest zone of combustion coincide to some extent.

It is well known, however, that the mantle changes in size by contraction after it is first lighted, while the governor continues to let the same quantity of gas pass. The flame therefore retains its size, and thus the condition just mentioned is no longer fulfilled. Consequently, the uninitiated person erroneously supposes that the mantle has lost a portion of its illuminating constituents. Lastly, the governor takes up a large part of the gas pressure, so that about 12-10ths of an inch pressure before becomes 6-10ths after passing it. Accordingly, a governor is not suited for obtaining the highest lighting power from Welsbach burners. It must also be noted that with Welsbach burners good admixture

of gas and air is important; and it is clear that this can only be obtained when the gas passes out with its greatest possible energy —that is to say, at full pressure up to the burner nipples.

There are therefore three essential points to be fulfilled in order to obtain the best possible lighting effect with the Welsbach burner—viz.:

1—Coincidence of the hottest zone of combustion with the mantle.
2—Power of regulating the hot zone of combustion by enlarging or reducing it, according as the mantle has more or less shrunk with usage.
3—The gas must retain its full pressure up to the point of outflow.

The rate of outflow of the gas at barely 3-10ths of an inch pressure is about 52½ feet per second; while at 12-10ths of an inch pressure it is about 105 feet per second. So that gas blowing out at the latter rate has considerably more *vis viva* than that at 52½ feet; and it is evident that the former can produce a more perfect admixture of gas and air than the latter. As already stated, these three conditions cannot be fulfilled by means of the tap, nor by a governor. If, however, a regulating screw is employed, which diminishes or enlarges the outlet orifice of the burner, it is possible, by screwing up or down, readily to control the flame so that it gives the highest lighting effect, while the hottest zone of combustion coincides with the mantle. Moreover, the condition is also fulfilled that the gas shall flow out with the maximum *vis viva*, and consequently a good admixture of gas and air ensues.

It is also to be observed that the mixing-tube in the original Welsbach burner has its air inlets too small. They should be enlarged in an upward direction. The regulating screw can be easily set by any one, by placing one hand between the flame and the eyes, so that the latter are not dazzled, and then screwing the regulator up or down slowly with the other hand. As soon as the maximum illumination is observed on a wall or floor lighted only by the burner in question, the most favourable result for that mantle has been secured. There should then be a gas consumption of about 0·04 cubic foot per candle; while the total illuminating power of the flame will have been raised from about 60 to 105 candles.

Manchester District Institution of Gas Engineers.—We are asked by the Hon. Secretary (Mr. R. G. Shadbolt, of Grantham) to notify that the Committee of the Institution are making arrangements to hold the autumn meeting at Hebden Bridge, on Saturday, the 13th prox., instead of the 30th inst. Particulars will be forthcoming at a date nearer that of the meeting.

The Poisonous Nature of Lead.—Our contemporary, the "Lancet," in their issue for the 2nd inst., called attention to the fact that lead is not only the mineral poison which causes the greatest mortality among those engaged in factories and workshops, but also that, of all metals, there is little doubt as to its being the one which causes the greatest number of deaths among mankind in general. This is a fact of which many workmen are possibly ignorant; and they would do well to bear it in mind.

The Damage to Gas-Mains at Ilford.—In the King's Bench Division of the High Court of Justice yesterday, Mr. Justice Lawrence gave judgment in the action brought by the Ilford Gas Company against the Ilford Urban District Council and Mr. Jackson, their Contractor, in respect of damage done to their mains through sewerage operations. The case was before him on the 26th ult., on third party proceedings (*ante*, p. 286); and yesterday he fixed the liability upon the Contractor, and gave the Council costs. Our report will appear next week.

A Face Mask for Gas and Chemical Works.—A new oil, gas, and waterproof face mask, with water and oil proof covering, has been brought out by Messrs. Wallach Bros., in order to meet the special requirements of gas and chemical works for an appliance of the kind. The name given to the mask is the "Evertrusty;" and it is connected by means of a tube with a special type of double-acting pump for the supply of air. By this means, the wearer of the mask can receive plenty of fresh air, and is thus enabled to work for a considerable time uninjured in even the most deadly atmospheres. The appliance appears to be a very complete and satisfactory one for its purpose; and we learn that there is already a considerable demand for it.

Gas Supply for the North Eastern Railway System.—The Directors of the North-Eastern Railway Company have decided to form a new Gas Department on their system, and a report on the subject has lately been presented to them by Mr. John Holliday, Assoc.M.Inst.C.E., Engineer and Manager of the Sutton, Southcoates, and Drypool Gas Company. After considering the report, Mr. Holliday was asked to undertake the preparation of the plans, estimates, &c., for gas and residual products works at Newcastle and York; and his Directors have allowed him to do so. The Newcastle works will be designed for an annual output of from 200 to 250 million cubic feet of gas, and the York works for 100 millions; and they will be arranged for future extension.

SUSPENDED STEAM-PUMPS FOR THE SINKING OF DEEP SHAFTS.

By W. Price Abell, Wh.Sc., M.Inst.C.E.

[Extracts from a Paper presented at the Meeting of the British Association of Water-Works Engineers.]

There is, in many districts, a prejudice against slung direct-acting pumps for sinking operations. This prejudice has arisen chiefly from two causes: First, because there are very few sinking pumps on the market that are suitable for the purpose; and, secondly, because where they have been applied they have not been installed in a proper manner, and due regard has not been given to meeting the various strains and difficulties that arise in working. The author condemned the usual plan of procedure in buying the cheapest pump and in using make-shift tackle—the object being to endeavour to show that the pumping operations during sinking can be carried on with ease and expedition without any of the troubles outlined, and that the progress made will certainly be at least twice as great, which means, in other words, at half the cost of the old-fashioned lifting-sets system, provided the most suitable pumps are employed for the purpose, and also (what is quite as important) that suitable tackle and winches are installed. This latter runs out, roughly, into double the cost of the pump, which fact has in the past been the cause of much temporizing and failure.

The pumps referred to by the author are made by Messrs. Joseph Evans and Son, of Wolverhampton, and have been used in connection with many well-sinking operations for water supply, including the Rugeley and Kingswinford sinkings for the South Staffordshire Water Company; also for the Hucknall Torkard, Nuneaton, Bilston, and Upwey Water-Works, as well as for the Government wells at Salisbury, and many similar installations.

In this system no fixings of any kind to the sides of the shaft are required. The pump, together with pipes and all attachments, is hung by means of long link chains fixed to suitable tackle at the surface. The pumps can be stopped, started, and lubricated from the surface; and in case of an inrush of water, or the breakdown of a pump, it can be entirely removed from the pit in a very few hours by the tackle at the surface.

The different strains due to the motion of the pump, as well as the expansion and contraction of the pipes and other contingent causes, must be carefully studied; otherwise difficulties will arise. With this system it is not advisable to use flexible hose of any kind. Suitable sliding suction-pipes of thick lap-welded wrought iron, and fitted with boiler-plate steel strainers, are used instead. A special form of strainer is employed, in which there is an internal dip-pipe, so that the water can always be drawn down to within an inch or two of the bottom of the strainer; and even should three parts of the holes in the strainer be exposed, the pump will not draw air. The object in using the long link chain is that a shackle can be put on the chain at any link, so that the lifting appliances can be tackled on at any point in a few moments; and when it is required to scotch the weight, a steel bar of suitable section is provided to pass through any link of the chain, and to rest on cross bearers at the pit mouth, so that the lifting tackle is thus liberated, and can be tackled on to another portion of the chain ready for the next lowering operation.

The lifting tackle recommended consists of steel wire rope and blocks; and two chains are employed on one pump, a special double-barrel winch. Where one chain only is used, however, an ordinary single-barrel winch is sufficient. By having rope-blocks for lifting, the winch only requires to lift a portion of the weight direct from its drum or drums, as, with 4 and 4 sheave-blocks, only about one-eighth of the total weight has to be dealt with direct from the drum of the winch. Such blocks for the purpose are not expensive, and can always be disposed of readily, if not afterwards required. The same remarks apply to the pumps themselves, and all pipes and tackle. There are many instances where installations of these pumps have been passed on from one sinking to another, and where prices have been obtained almost equal to those paid for them when new.

The bucket type of pump is found most efficient for dealing with large quantities of water down to a depth of 60 fathoms. Beyond this depth, the slip soon runs to 50 per cent., and the ram-pump then becomes most efficient. In some installations where large quantities of water are met with at a greater depth than the above, it is advisable to fix an inset engine at 50 or 60 fathoms. This engine should be of the condensing type, so as to work as economically as possible, and then continue the sinking with the slung pumps, delivering their water to the inset. Afterwards the engine can be removed to the bottom level, being designed with that object in view.

Examples of work done with these pumps were given by the author; and, concluding, he remarked that note should be made that the severe and exceptional demands of sinking on any pump must of necessity give rise to difficulties, and that in organizing any scheme it is well to accord full value to two points: "Don't underestimate the water and other difficulties you have to deal with!" and "Don't tinker!"

Discussion.

Mr. W. Matthews (Southampton) characterized the paper as

an eminently practical one. The operations described seemed to have been attended with great success, which proved the value of the methods adopted. The whole gist of the paper was summed up in the words at the end—"Don't underestimate," and "Don't tinker." There was one omission in the paper, and that was the consumption of steam in this particular type of pump. Of course, in a good deal of mining operations, the consumption of a few pounds of coal more or less was not a matter for consideration; but where the operations were drawn out to a considerable length and extended over a long period, there the question of the economy of the pumping plant became a matter of very serious concern. He should like to know how the author got on with the condensation in steam-pipes running down to such a considerable depth. His own experience was that the only satisfactory way of getting rid of the steam was to permit a small amount of blow-off in the bottom of the well—to allow the condensation of the steam to go free at the bottom. One would also have liked to know the cost of pumping a million gallons of water under this system, and the time that would be occupied, generally speaking, in rigging up the plant.

Mr. R. S. Lloyd (Messrs. Hayward-Tyler and Co.) observed that for mining work he believed that sinking pumps were developing on the side of electrically driven plant on account of the trouble of getting rid of the steam, and also from the point of view of economy.

Mr. T. Kennedy (Kilmarnock), referring to one of the author's examples of work done, said he noticed that he had bricked the first 100 yards. He should like to know the thickness of the brick, and whether the author had arranged for it to be filled in with cement or lime.

Mr. W. Watts (Little Don Valley Water-Works) said a pump that could be easily lowered to the bottom of a well in order to lift the water from the floor to enable the men to proceed with the sinking, a pump that could be shifted from one part of a shaft to another, and from one part of a trench to another, and a pump that could resist the wear and tear not only of the grit formed by the execution of the work, but the wear and tear of repeated blasting, was a very desirable one for the purposes dealt with in the paper. He had had to do in his time with a good many pumps, and some of them had been gimcracks. He congratulated Mr. Abell on having noticed the "tinker" work which so often obtained in sinking. As Mr. Matthews had very properly said, it was a good thing to make ample provision for the condensed water at the bottom of the shaft, so that the dry steam might get to the place where it had to do its work. On the surface of the ground, they could do this easily by having the steam generator at a lower level than where the pump was at work. It was a good thing, when steam had to be sent a considerable distance, to have the boiler at the lowest level possible, and then the condensed water would stay there, and the dry steam would go to the motor. He greatly appreciated the remarks of the author about making a proper provision of tackle for suspending the pumps and getting them into position. He had had something to do with pulsometers; and the only fault he had to find with this type was that it was an extremely expensive pump. It was very efficient and very handy indeed; but when this had been said, he had gone as far as he well could do. The amount of coal consumed was so considerable that it made the pump rather expensive to work; and if they could introduce a pump of the kind that Mr. Abell had suggested in preference to the pulsometer (he was presuming it did not take anything like the amount of steam the latter did), he thought they would have done a good stroke of business. He also referred to his experience with rotary pumps. The principal difficulty was that of moving them about from one place to another. However, he had found them remarkably good for great depths.

Mr. C. H. Priestley (Cardiff), alluding to Mr. Lloyd's remarks, stated that the mining engineers of South Wales would not fix electrical machinery in the old collieries. Coal being at their doors, they said it was better to use coal and steam than electricity. But for new collieries that were being sunk, he was told that electrical machinery was likely to take the place of steam.

Mr. J. S. Pickering (Nuneaton) said he had had to superintend the sinking of several deep wells; and the conclusion he had arrived at was that it was impossible to get a better steam-pump than the one referred to in the paper. The advantages of using a pump of this description was that according to the quantity of water met with, so the number of pumps could be readily increased. In a shaft he had sunk to 220 yards, he had had one of these deep-sinking pumps at work, with steam only at 80 lbs. pressure; and the water was pumped from the bottom to the top. A rough estimate of the quantity of steam required would be about 1 lb. to every foot of depth. It had been suggested that they might be uneconomical in use. There was no doubt about it; but, of course, it must be remembered, in looking at the working costs, that the pumps were only temporary ones. He had had occasion to work out the comparative cost of pumping; and he found this: Pumping from a depth of 70 yards, and $\frac{3}{4}$ million gallons of water per day, the cost worked out to $4\frac{1}{2}$d. per 1000 gallons; but when permanent plant was put down, with proper continuous engines, the cost of pumping was only about $1\frac{1}{2}$d. per day. When, however, one was sinking a well, it was not the cost of the steam, but the speed with which they could carry out the work. What these pumps were designed for was quick working and sinking. In fact, he now found it more economical to sink a well 200 feet in depth than to put down a large borehole; and the cost of the sinking itself compared very favourably.

Mr. J. H. Crowther (Wallasey) was simply astonished to hear one of the members say it was more economical to sink cheap wells than to put down a borehole. He did not agree with him. His own opinion was that the days of deep wells had gone by, and that in future they would have nothing but borings, and their pumps working directly in the borings. With boreholes they had greater flexibility; and altogether it was cheaper, quicker, and, in every way to his mind, better to work with boreholes than with wells. He knew something of the particular pump mentioned by the author; and, so far as he knew, it was one of the cheapest in working of the direct-acting pumps.

Mr. Percy Griffith (London) observed that as the author suggested the economy of these pumps rendering well sinking comparatively easy, it was permissible to argue the comparative value of wells and boreholes. He (Mr. Griffith) had successfully accomplished some rather interesting wells; but he was decidedly of the opinion of the last speaker, that the very great extra expense involved in sinking a large shaft (even where sinking could be conveniently carried out, and facilities be given for the suspension of the pumps and the design of the pumps used) was not justified under normal conditions, and where water could be readily got at. There were, of course, conditions where a shaft would be necessary and a boring would be practicable; and he illustrated the point.

Mr. Lloyd here interposed the remark that, with regard to electrically driven pumps, his firm had made several sets to lift 140,000 gallons an hour.

Mr. Chapman was also of opinion that boring was much cheaper than sinking.

The President, in closing the discussion, regretted that the author was not present to reply to it.

TURBINE PUMPING PLANTS AT WATER-WORKS.

At the recent Meeting of the British Association of Water-Works Engineers, three papers were presented describing different turbine-driven plants at water-works. The first was by Mr. C. Sainty, of Windsor; the second by Mr. C. G. Mason, of Guildford; and the third by Mr. A. T. Walker, of Reading.

Taking them in the order submitted, Mr. Sainty's communication has to be noticed first. It dealt with the turbine-driven plant at the Windsor Corporation Water-Works, of which he is the Engineer. The present works, the members were informed, originally belonged to a private gentleman, who subsequently transferred them to a Company. In 1888, the Corporation purchased the works, at which time there were two of Cutler's patent balanced turbines, working two horizontal pumps each. The turbines are 9 ft. 6 in. diameter outside, 8 ft. inside, 1 ft. 6 in. deep, and have 52 buckets; an area of 1872 square inches; and, with a 4-feet fall, give 42·33-horse power each, The average weight of each turbine is 6 tons. The pumps are 9-inch diameter, and have a 33-inch stroke, and make on an average fourteen revolutions per minute. In 1890, the demand had increased to such an extent that the Corporation decided to put down another pair of turbines on the stream that was originally used for driving a water-wheel for a flour-mill. These turbines were erected by the author and started in 1891. They are of the same type as the previous ones.

The works are admirably situated for a water-power station. At the same time the Thames in this particular reach (which is very short) is unusually erratic in flow. For instance, the author has known a fall of 7 to 9 inches in one hour; also, after heavy rain, the water has risen from 8 to 10 inches in an hour. Therefore, with a plant of this kind one has to be constantly on the alert. There being no storage reservoir, the water is pumped direct from the wells to the consumers; and the average pressure is 58 lbs. per square inch during the day, and 70 lbs. per square inch during the night. There are 24 miles of mains in the district; and the service is constant.

There is, in addition to the turbines, an undershot water-wheel 22 feet in diameter, 10 feet wide, with 80 blades (40 in each side section) running on a 7-inch shaft, driving one pump 13 inches diameter, with a 4 ft. 10 in. stroke, connected to a crank on one end of the shaft; and on the other end is a crank connecting another pump 12 inches diameter, with a 3-feet stroke. This wheel makes an average of four revolutions per minute, and is very useful, especially in flood times. The author has seen the water flowing over the main shaft, and the wheel driving the two pumps named against a pressure of 50 lbs. per square inch.

The head-water which works the turbine is admitted into a cylindrical chamber, closed at the top by a cover. Around the periphery of the upper part of the cylinder are openings between guide blades, through which the water passes to the turbine wheel, which surrounds this part of the cylinder. The turbine wheel is carried on an 8-inch shaft, and has on the end a gun-metal bush running in a step bearing lined with lignum vitæ at the bottom end, which is the main bearing for the upper part of the turbine wheel. The area of the cylinder is such that the upward pressure of the head-water leaves no weight on the step. Therefore the

turbine balances itself during the time it is at work. The turbines put down by the author in the year 1891 have been running constantly day and night against an average pressure of 62 lbs. per square inch, and were only stopped for the foot-step to be relined in September, 1901. On the upper end of the 8-inch shaft is a disc with a crank-pin for driving the two pumps named, which are set at right angles to each other.

On each delivery-main, from the turbines and water-wheel, is a safety or relief valve, set to relieve mains at 80 lbs. per square inch pressure. The attendant at the turbines sets them according to the fall; so that, as soon as the pressure is at its normal height, the turbines slacken down, and if the pressure drops, the speed is increased.

Mr. C. G. Mason, the Borough Engineer of Guildford, in the second paper, described the turbine pumping plant at the waterworks in that town. He gave a brief introductory account of the manner in which the Corporation acquired the water power now at their disposal, from which it is learnt that by 1893 they had acquired the whole of the water power (estimated at about 87-horse power) in the reach of the River Wey in which the waterworks are situated. Subsequently the Council adopted a scheme to lay down a new set of 8-inch horizontal pumps, to be worked in conjunction with an existing undershot water-wheel, and lay down two 33-inch "Victor-Drayton" turbines to drive the pumps. The turbines are driven by a 6-feet head of water if the level in the mill pool is normal; but very fair pumping results are obtained if only a 5-feet head can be secured. The forbay in which the turbines are situated is 16 feet square, and may be described as a double chamber constructed of brickwork, rendered in cement, with a concrete floor carried upon iron girders, dividing the upper from the lower chamber; the flow of water being controlled by an elliptical iron gate, which is opened or closed by an arrangement of gear wheels sliding on a horizontal iron rack. Two gratings are placed up stream so as to prevent weeds, branches of trees, and other matters passing into the bay, and choking the turbines.

The work was carried out by Messrs. Nell, of Queen Victoria Street, E.C. Their tender comprised the two 33-inch diameter "Victor" turbines of the cylinder gate type, and one triplex double-acting pump, together with the necessary harnessing. The pump is vertical, having pistons 8 inches diameter by 12-inch stroke, designed to make 30 revolutions per minute, and at this speed to be capable of raising 360 imperial gallons of water per minute (after allowing 5 per cent. slip) against a head of 150 lbs. pressure (although the requirements only called for 110 lbs.) when pumping into the high-pressure reservoir, and 55 lbs. when pumping into the low, as registered by the gauges in the pump-house. The pump is fitted with brass-lined glands; all valves are of hard rubber with back brass plates and springs; and the pump is fitted with relief-valves and brass priming pipes attached to the rising-main. The connecting-rods are steel, finished bright, with ends of the marine type. The crank-shaft is of forged steel, finished bright; machine-cut gear wheels being keyed at each end. These gear on to the $33\frac{1}{16}$ inch diameter shaft over the turbine, in the proportion of 5 to 1. The turbines are capable of developing $27\frac{1}{2}$ brake horse power each, and 55 brake horse power when working together under the maximum head.

Owing to the low fall, and the River Wey being subject to floods, the turbines are of the vertical type; the power being transmitted from the vertical shaft of the turbines on to the horizontal shaft driving the pumps by means of bevel gear wheels 34, 40, and 19 inches, 13 inches diameter by $5\frac{1}{2}$-inch face and 2-inch pitch. All bearings are of the ring oiler type, and are supported by steel rolled beams.

The turbines and pumps have quite fulfilled the conditions required of them, and with a good flush of water, with the maximum fall, will regularly lift from 18,000 to 19,000 gallons of water per hour to a height of 280 feet without being run at their full speed; while from the tank or intermediate lift adjoining the well they have registered 141,000 gallons in seven hours and 162,000 gallons in eight hours on a continuous run.

In the third paper, Mr. A. T. Walker described the water-power pumping plant of the Reading Corporation Water-Works, of which he is the Engineer. We will pass over the early history of the undertaking which he gives, and start with the year 1851, when the old Water Company obtained an Act for the extension and improvement of their works, including the purchase of the old Southcote mill and its rights of "user of water power," and also of adjoining lands for the erection of a pumping-station. These works are situated on the River Kennet, about two miles further away from the town than the original pumping-station. The pump-house and pumping plant were constructed from plans prepared by the late Mr. James Simpson, and consisted of two "breast type" water-wheels each $15\frac{1}{2}$ feet diameter, $8\frac{1}{2}$ feet wide, working under a head of 6 feet, and each giving about 15 effective horse power. Each wheel operated a set of three single-acting pumps, 12 inches diameter, with a 36-inch stroke, delivering from about 800,000 to 1,150,000 gallons per day of 24 hours against a head of 90 feet. This plant continued to supply Reading with water from 1852 up to 1878; the original water power being used up to the same date for street-watering purposes during the summer months.

In 1878, an additional water-power pumping-station was constructed nearer the town at Fobney Lock, also on the River Kennet. The plans for this were prepared by the late Mr. W. Donaldson, the plant consisting of two Fourneyson turbines, working under an average head of 6 ft. 6 in., each turbine driving by direct action two sets of ram pumps 16 inches diameter, with a maximum stroke of 22 inches, and a minimum stroke of 4 inches. The stroke can be altered between these limits to suit the conditions of the river, the head varying from 100 feet to 250 feet, although for some years it has not been necessary to pump against more than 100 feet head. The free wheel or runner of each turbine is 6 inches diameter, with a vertical shaft 6 inches diameter. The toe-piece or end is brass bushed, and revolves in a cast-iron footstep lined with lignum vitæ; the bearing-block being of the same material. The power of this plant is from 35 to 40 pump horse power. The flow of water required for the two turbines (which are of the outward-flow type) when at their best, is from 4500 to 5000 cubic feet, to raise from 900,000 to 1,250,000 gallons to the lower head, and from 500,000 to 700,000 gallons to the greater head.

Up to 1890, Reading depended solely upon its water-driven plant; but in that year steam power was added to the Fobney works—the old water-wheels and pump at Southcote lying idle. In 1899, a system of covered filters was, however, constructed here; the old mill being utilized for the purpose. At the same time, the water-wheels and pumps were overhauled, and the delivery mains cleaned. At the present time, the water-power pumping plant in use consists of two turbines at the Fobney pumping-station and two water-wheels at Southcote, jointly raising about 1,450,000 gallons per day of twenty-four hours.

The author is of opinion that in rivers similar to the Thames and the Kennet, water power is a very variable and uncertain factor to depend upon. Drought, floods, and more especially frost, when "ground ice" makes its appearance, are all liable to cause a breakdown or interfere with the working of water-driven plant; and the author, therefore, considers such plant unsuitable for water-works purposes except as an auxiliary source of power.

Discussion.

The PRESIDENT (Mr. Frederick Griffith) said that he had not seen the completed work Mr. Sainty had described; but he had had an opportunity of examining some parts of it during its construction at Leicester. If he might judge of the entire work by the substantial nature of what he had seen, the works at Windsor were of no ordinary character. They seemed to be very interesting indeed; and he had no doubt a visit there at some time would be exceedingly acceptable to the members.

Mr. W. MATTHEWS (Southampton) remarked that from Mr. Mason's paper the members could get the efficiency of the turbines; and he judged they could also get it from Mr. Walker's. If Mr. Sainty would let them know the quantity of water that was being supplied to these turbines, they would be in a position to say what was the relative value of the various types brought to their notice. Probably Mr. Mason would like to correct what he (Mr. Matthews) believed to be a mistake as to the horse power of the turbine. Mr. Mason said the turbines were capable of developing $27\frac{1}{2}$ brake horse power each, and 55 brake horse power when working together. He suggested to him that this was wrong. If he took 20,000 gallons of water raised to a height of 300 feet, he would find he would want at least 30-horse power net; and therefore he would probably need 34 or 35 brake horse power. This was no doubt a clerical error, but it was one that should be put right.

Mr. SAINTY, in replying to a vote of thanks later in the proceedings, said he should be very pleased to make arrangements for a visit of the members, if one could be organized, to see the Windsor plant; and the Mayor, who was an engineer, would also be only too delighted to see the members there.

Mr. Mason and Mr. Walker were unfortunately absent; so that a reply was not given to Mr. Matthews.

Street Opening in the Metropolis.—At the last meeting of the Court of Common Council, the Streets Committee reported on the subject of a letter received from the London County Council, asking the Corporation to join them in an application to His Majesty's Government to promote legislation next session for regulating the breaking up of the London thoroughfares by the gas, water, electric, and other companies having statutory rights, and recommending that the Council be informed that the Corporation were prepared to co-operate with them in the matter, on the understanding that they retained complete and absolute control over the streets in the City. The report was carried unanimously.

Gas-Works Extensions at Birstall.—Last Thursday morning, at the Birstall District Council Offices, Mr. R. H. Bicknell, M.Inst.C.E., inquired into the application of the Council to borrow £3000 for gas-works purposes, including the extension of the carbonizing plant. The Clerk of the Council (Mr. W. Middlebrook) stated that the population of Birstall was 6559, that the assessable value of the district was £21,094, and that the total outstanding loans were £54,404. The gas-works were bought by the Council in 1872, and the amount authorized to be borrowed was £40,000. Under a Provisional Order granted in 1887, the borrowing powers were increased by £6000, and sanction was obtained the same year for raising £2600. This left a balance of £3400. The Inspector observed that the Council were going perilously near the margin. The Clerk said he would ask that the amount to be borrowed should be for thirty years, as the original loan would expire exactly at the end of that time, and it would be preferable for them to expire all together.

REGISTER OF PATENTS.

Purification of Gases obtained from Generating Furnaces, &c.—Lencauchez, J.A., of Paris. No. 14,483; July 16, 1901.

This invention relates to means for purifying gases obtained from gas generating furnaces, "high furnaces," and so forth, which, as is well known, often carry a large amount of suspended matter that cannot be eliminated satisfactorily even in the most perfectly constructed scrubbers or other existing washing apparatus.

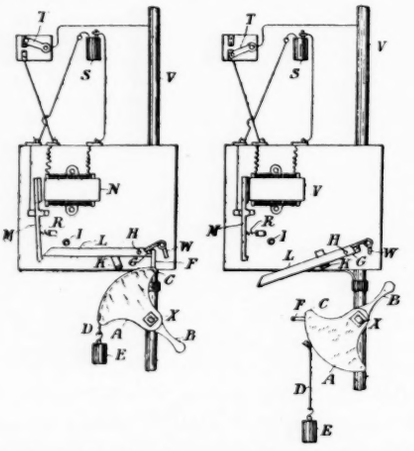
The dust suspended in the gases of furnaces (and referred to by manufacturers as "sublimed") is composed of silica, lime, alumina, magnesia, oxide of iron, carbonates of lime and magnesia, and other substances in the form of impalpable powdered substances of a greasy nature, which are capable of traversing the various galleries and flues of the generator without becoming deposited, and which finally escape through the chimney, and spread over large distances around.

Instead of employing towers or washers or scrubbers, the patentee arranges, at any point in the gas-conduits, a centrifugal fan or turbine wheel into which is directed, by any convenient means and at any pressure, a cold or hot water current. The centrifugal force of the fan or turbine produces intimate contact between and commingling of the gas and the water introduced, and so enables the water to completely free the gas of its suspended impurities. This is the characteristic principle of the invention; and in practice the construction of the fan may be varied to suit different requirements.

Automatic Safety Gas-Valves.—Thompson, W. P.; a communication from H. Rostin and S. Szubert, of Berlin. No. 15,968; Aug. 8, 1901.

This invention relates to an automatic appliance "serving to prevent the dangers resulting from the escape of gas when the flame has been extinguished and the gas cock or valve is open"—consisting in means for utilizing an electric current for automatically closing the gas cock or valve of the gas-pipe, when the flame of a burner has been extinguished and an electric circuit has been closed by a known means actuated through the agency of a solid, fluid, or gaseous body, which, having been previously heated by the flame, automatically contracts in volume after the flame has been extinguished. When the flame has been extinguished, a signal may be actuated, or mechanical means be employed, to operate the shutting-off of a gas-valve.

In order to close the gas-way through the agency of the electric current, the plug X of the gas-cock carries, mounted on a square portion, a segment-shaped key A provided with a handle B. A groove is cut in the arc shaped portion of the segment; and within it a cord, chain, or wire (carrying a weight E) is secured to the segment near the upper point C. When the valve is open, the weight has the tendency



to close the valve by drawing the segment down in the position shown in the right-hand view. To prevent the weight turning the segment and closing the valve, normally, the following means are employed: From the segment there extends a stud F, secured near the the upper point C of the segment, and bearing against another stud G projecting from a lever L pivoted at H on a plate on the gas-pipe, and limited in its throw by stops I and K. The forward end of the lever L is supported by a notch of an armature M adapted to pivot in proximity to an electro-magnet N. A spring R tends to force the armature M away from the magnet N. A source of electricity S is established at any convenient place. A switch T connects to the gas-pipe V, and through the same with the segment A. For closing the switch, the electrical contact may be employed, which is made by any suitable means as soon as the flame of a burner is extinguished. Means for obtaining such a result are well known.

While the switch T is open, as in the left-hand view, the circuit of the battery is broken; but as soon as the switch is closed, a circuit is established passing from the battery to the coil of the magnet N, the switch T, pipe V, segment A, studs F and G, lever L, armature M, and back to the battery. The magnet N being energized by the current passing through the coil attracts its armature M; and the hook supporting the lever L will thereby be withdrawn. The lever L accordingly descends; the second-named stud G no longer retains the other stud F; and the segment A is free to be turned by its weight E so as to shut the gas-valve. The circuit of the battery is broken as soon as the lever L drops, as the studs F and G, on one side, and the end of the lever L and armature M are separated. The circuit is broken though the contact of the switch T continues.

By opening the gas-valve, on turning the handle A downwards, one stud F will strike one arm W of a bell-crank lever, the other arm of which will accordingly force the other stud G down and raise the lever L. The armature M, having been returned to its original position by the spring R, will again catch the lever L and support it. But as long as the switch is closed, the circuit would be re-established, and the valve immediately be closed again. For keeping the valve open, the switch must first be opened and the handle of the segment then be turned downwards.

Gas-Meters.—Boult, A. J.; a communication from la Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz, of Paris. No. 16,064; Aug. 9, 1901.

This invention relates to a gas-meter in which "the operative measuring device or paddle-wheel is so constructed as to balance the interior pressures in the longitudinal direction of the axis, and it is combined with a compensating device provided in order to avoid incorrect measurement which might otherwise be caused through variations in the water level in the meter."

Further reference to the invention in this column is not necessary, as in "Technical Record" to-day a full illustrated description of the meter is given—p. 398.

Manufacture of Gas.—Westinghouse, G.; a communication from W. J. Knox, of Allegheny, Pennsylvania, U.S.A. No. 16,699; Aug. 20, 1901.

To produce gas by endothermic reaction, the patentee remarks, it is necessary to supply the requisite heat to the materials under reaction. It has previously been proposed to effect this by: (A) Application of heat to the exterior of the chamber containing fuel. (B) Heating the brickwork of the gas generating chamber prior to the introduction of fuel. Both of these processes are characterized by excessive loss of heat. A third system already proposed is: (C) To convey the needful heat to the fuel by means of the steam used in the manufacture of water gas. This also has proved impracticable, because the quantity of steam that will combine with a unit mass of carbon has not, at any practicable temperature, heat-carrying capacity sufficient to convey the needed heat energy to satisfy the endothermic requirements of the reaction. The ordinary method of furnishing the heat necessary for gasification in a water-gas process is by direct combustion of a portion of the fuel with air; but this means of supplying heat for the reaction is "wasteful of fuel."

The present invention consists in circulating through the producers a large quantity of gas serving as a heat carrier, and in alternately cooling and heating the circulating gas, so that the gas shall enter the producers at a high temperature and deliver up heat to the contents of the producers, and, before it is returned to the heating apparatus, cooling it to such a temperature that the end of the heating apparatus which it enters shall be maintained at a comparatively low temperature. The heating apparatus must be periodically reheated by the consumption of fuel; and that this may be done economically, it is necessary that the end of it from which the products of combustion are delivered shall be kept at a moderate temperature—otherwise a large amount of heat would escape to the flues and thus be wasted.

The inventor makes use of a chamber for producing the gas, a chamber for heating the gas, and means for forcing the circulation of the gas through the apparatus, such as a fan, all suitably connected together, and so that the fan will cause the gas to pass through the heating chamber into the producing chamber, and thence back again to the fan. In practice, it is necessary to use a large volume of gas—five or six times the amount of the gas produced at each passage round the circuit. Thus the gas produced is also the heat conveyor; and in order that it may carry heat to the producer, it is passed through the heating chamber, from which it takes up heat and conveys it to the producer, where a fresh volume of gas is generated and added to that already in circulation. The gas which escapes from the producer is at a very high temperature. The gas is therefore cooled before it passes to the reheating chamber, and the heat given out is utilized in subsequent operations. In the complete cycle, therefore, the gas is at one part heated and at another part cooled, and the heat stored. In order to utilize the stored heat, the direction of the flow of gas is periodically reversed through the apparatus. During the continuance of the process, the volume of gas is necessarily augmented, and the surplus gas is withdrawn, preferably at or near the fan or equivalent device; the balance of the gas passing through the fan in order to recommence the cycle.

Gas Lighters.—Baader, H., and Rau, E., of Munich. No. 25,270; Dec. 11, 1901.

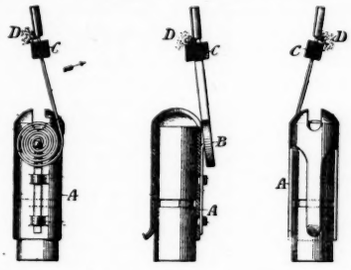
With this electric gas-lighter, the supply of gas can be regulated at the desired moment by a device operated by three contacts. At the first contact, the gas enters the ignition-pipe, only a small portion entering the main-pipe; at the second contact, the pipe leading to the ignition-jet is closed; and at the third contact, the main-jet itself is extinguished. The plug of the cock regulating the supply of gas simultaneously operates as switch for the current; being provided with a strip of insulating material let into its face, on which a spring provided with a spring tongue slides. The patentees' idea is to obviate the objections to the use of gas-lighters with only two contacts. The defect of these latter is that at the first contact the gas supply to the main-flame is fully opened, while through the narrow ignition-pipe relatively little gas can flow. For this reason, the lighters frequently fail to act, or, in the case of incandescent gas-burners, ignition does not occur until the cylinder is filled with gas, when violent explosion and severe shock results.

Gas-Lighters.—Anderson, E. de N., of Manhattan City, U.S.A. No. 9874; April 29, 1902.

This invention relates to automatic gas-lighters adapted for attachment to burners, and in which there is used a pellet which has the

property of absorbing gas and becoming sufficiently heated by the absorption to cause an ignition of the gas.

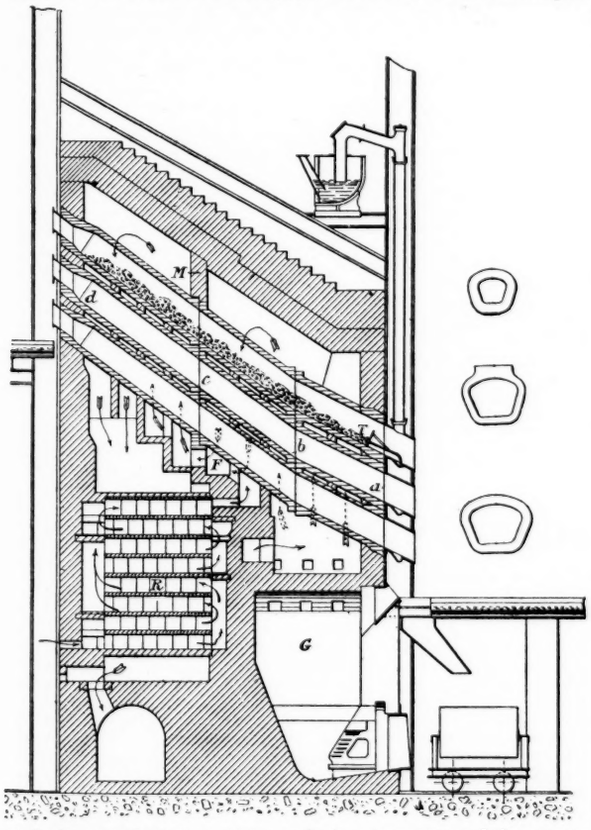
The attachment (as shown) comprises a body A fitted with a spring tongue, which exerts sufficient pressure to hold the attachment in place on the burner used. To the frame A is secured a spiral B, the other end of which carries a suitable catalytic or igniting substance D, preferably supported on a carbon block C. The particular substance used forms no part of the invention. When the gas cock is opened, the catalytic substance D will become heated by absorption,



and will ignite the gas in the well-known manner. The heat being communicated to the spiral, the latter will expand, causing the arm to which it is fixed to swing outward, as indicated by the arrow, thus carrying the igniting substance D away from the flame, and preserving it from carbonization and other deteriorating influences. When the gas is turned off, the spiral being no longer heated will contract—thus swinging the igniting substance D back into the required position for the next action.

Inclined Gas-Retorts.—Derval, E., of Paris. No. 10,539; May 7, 1902.

In the course of his specification, the patentee remarks: One of the chief objections to the use of inclined retorts is the impossibility of giving to them such an inclination as will allow of their being charged to a uniform thickness and at the same time allow of the automatic discharge of the coke. With good charging apparatus, the charging of the retorts is generally effected tolerably well with inclinations varying from 29° to 34°—according to the nature of the coal and its degree of humidity. But if it is desired to increase the angle of inclination in order to facilitate the discharge of the coke, the coal accumulates against the stopping-plate placed at the lower end of the retort and sometimes passes over the plate into the mouthpiece. With inclinations to the horizontal exceeding 34°, the distillation is often incomplete



at the lower end of the retort—partly in consequence of the greater thickness of the layer of coal at that point than at other parts of the retort, partly in consequence of the cooling produced by the gas escaping from the retort, and partly in consequence of the comparatively low temperatare of the retort at the place where the stopper-plate is situated, and by reason of other circumstances.

The most suitable inclination to be given to the retort varies, of course, with the different kinds of coal used; and the present invention is said to enable these inconveniences to be obviated. It consists in diminishing the inclination of the end of the retort at which the coke is discharged, and in increasing the inclination of the end at which the coal is introduced, "so that the general mass of the coke puts itself in motion immediately the coke at the lower end of the retort has been withdrawn."

In consequence of the slight inclination of the lower part *a b* of the retort, the thickness of the layer of coal will diminish towards the stopper-plate T, "which will enable the distillation of the coal at the lower end of the retort to be more completely effected." As regards the distillation of the coal at the point *b*, where the layer of coal is thickest, it may be made as complete there as at other parts by increasing the temperature of the furnace at that point. This may be effected by arranging the furnace as shown, in which the arrows indicate that the gas issuing from the gas-producer G is partly burnt by a first admission of hot air at the lowest part of the retorts, so that it is easy to obtain at that point as high a temperature as may be desired. The furnace gases are afterwards brought under the retorts by a wall M, reaching to the arch of the furnace or retort-bench, and are reheated towards the middle of their course, at the point F, by a second admission of hot air which completes the combustion of the furnace gases before they reach the regenerator R. These two admissions of hot air are regulated once for all by the dampers for the admission of cold air to the regenerator.

The inclinations of 28° and 36° indicated in the drawings for the lower and upper parts of the retorts respectively are those the patentee has found most suitable. In principle, the inclination of the part *a b* should be such as will not prevent the sliding down of the coke contained in the more inclined part of the retort, once such coke has been set in motion, but "should be slight enough to form a sort of brake which will prevent a too rapid descent of the coke, which might be inconvenient, especially when a hot-coke conveyor and quencher are employed for the removal of the hot coke."

Cross sections of the retort are given at the points *a*, *b*, *d*. The second length *b c* may have an inclination intermediate between that of the lengths *a b* and *c d* respectively; and instead of making the lengths straight, they may be made of a curved shape, so that when the lengths are put together the retort will have a curved shape approximating more or less to the polygonal shape produced by the connection together of several straight lengths set at various inclinations.

APPLICATIONS FOR LETTERS PATENT.

16,668—Clapham, S. B., "Condensing apparatus for use in the manufacture of gas." July 28.

16,695.—Harrison, H. T., and Bastian, C. O., "Meters." July 28.

16,702.—Sugg, W. T., "Lamps for incandescent gas lighting." July 28.

16,732.—Nicolai, O., and Bulding, A., "Self-acting igniters." July 28.

16,734.—Lake, H. H., "Incandescent gas-lamps." A communication from The S. Bernstein Company. July 28.

16,773.—Keith, J. & G., "Bye-pass cock for incandescent gas-burners." July 29.

16,800.—Featherstone, J., "Carburettors for use in internal combustion engines." July 29.

16,849.—Oving, H. E., "Gas-mixing apparatus." July 29.

16,850.—Bergner, H., "Electric igniters for gas-burners." July 29.

16,885.—Hindle, F. W., "Chimneys for use in connection with incandescent gas lighting." July 30.

16,889.—Elliott, S., "Purifying gases." July 30.

16,892.—Harvey, E. C., "Gas heating appliances." July 30.

16,938.—Godeau, J., "Geysers." July 30.

16,949.—Westley, J., "Through-way taps." July 31.

16,951.—Mackeniot, C. A., "Rotary exhausters for gas or air." July 31.

16,955.—Lowden, J., "Treating gas lime for the purpose of enhancing its value as an article of commerce." July 31.

16,986.—Thwaite, B. H., "Producing power gas." July 31.

17,006.—Schwab, M., and Greene, H. and Sons, Ltd., "Lighting gas-burners." July 31.

17,154.—Archer, D. J., "Gas and air mixers." Aug. 2.

Power for the Westinghouse Works.

With regard to the letter on this subject which appeared in the "Journal" for the 29th ult. (p. 284), Mr. Kendrick informs us that he should have said the Stretford Gas Company supply *nearly all* the coal gas consumed in Trafford Park. The Salford Corporation supply a small portion of the Park near the Barton Bridge over the Ship Canal; but this is about 1½ miles from the Westinghouse works, and about 2 miles from the other large works in the Park.

The Lowell (Mass.) Coal Storage Plant.

Referring to the description of this plant which appeared in the "Journal" for the 15th ult., we learn from the Engineer of the Riter-Conley Manufacturing Company, of Pittsburg (Pa.), that they were the designers and builders of the plant, and that Mr. Bowman, who described it at the meeting of the American Association of Mechanical Engineers, is the Chief Engineer of their structural department, and not Engineer of the Lowell Gas Company for whom they erected it.

The Directors of the Colne Valley Water Company have been authorized to raise £25,000 of additional share capital, and a sum of £12,500 by debentures; making a total of £37,500.

The Directors of the Newcastle and Gateshead Gas Company have declared an interim dividend upon the ordinary stock for the half year to June 30 at the rate of 4½ per cent. per annum. This dividend is equivalent to one of 9 per cent. upon the stock as it stood previous to conversion on Jan. 1 last, and is the full statutory dividend which the Company are authorized to pay upon their ordinary stock. A dividend at the rate of 4 per cent. per annum has been declared upon the preference stock; this also being the full statutory rate.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Bills down to the prorogation of Parliament last Friday:—

Bill presented and read the first time: Gas Regulation Bill (to regulate the supply of "water gas" and other poisonous gases).

Bills Royal Assented: Consett Water Bill, Devonport Corporation (Water) Bill, East Worcestershire Water Bill, Gas Orders Confirmation Bill (No. 2), Gas and Water Orders Confirmation Bill (No. 2), Glasow Corporation (Gas, &c.) Order Confirmation Bill, Leicester Corporation Bill, Margate Corporation Water Bill, Menai Bridge Urban District Council Bill, Newport Corporation Bill, Nottingham Corporation Bill, Omagh Urban District Gas Bill, Water Orders Confirmation Bill, Weardale and Shildon District Water Bill, Whitstable Improvement Bill, Ystradfellte Water Bill.

The Edinburgh and Leith Corporations Gas Order Confirmation Bill (see *ante*, p. 358) was presented and read the first time last Tuesday; and, in pursuance of the Private Legislation Procedure (Scotland) Act, 1899, was deemed to have been read a second time and reported from the Committee. It was read the third time and passed on Thursday, and received the Royal Assent the following day.

HOUSE OF COMMONS.

The following further progress was made with Bills down to the prorogation of Parliament last Friday:—

Lords Bill reported: Ystradfellte Water Bill.

Lords Bills read the third time and passed: Devonport Corporation (Water) Bill, Edinburgh and Leith Corporations Gas Order Confirmation Bill, Gas and Water Orders Confirmation Bills (Nos. 1 and 2), Leicester Corporation Bill, Margate Corporation Water Bill, Menai Bridge Urban District Council Bill, Nottingham Corporation Bill, Whitstable Improvement Bill, Ystradfellte Water Bill.

At the sitting of the House on Wednesday, the Order of the 12th of February for the second reading of the London Water (Purchase) Bill, promoted by the London County Council, was read and discharged, and the Bill withdrawn.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION.

Monday, Aug. 4.

(*Before Mr. Justice* BIGHAM.)

Mayor and Corporation of Northampton v. Ellen.

This was a special case stated for the opinion of the Court, raising the following questions: (1) Whether the plaintiffs were entitled to differentiate the water-rate; (2) whether they were entitled to demand a water-rate of the defendant within a period of ten years from the date of the Extension Order of 1900, so long as the rates payable by him, exclusive of water-rates, amounted to 5s. 6d. in the pound; and (3) whether they were entitled to reduce the water-rate for the purpose of creating a deficiency. The circumstances which gave rise to the appeal to the Court were briefly mentioned in the "JOURNAL" for Aug. 27, 1901 (p. 529). An action (understood to be a test one) was brought to recover £1 4s. 9d., the amount of the quarterly instalment of the annual rate for the supply of water for the domestic use of a dwelling-house at Kingsthorpe, a district which had formed part of the area of supply since 1861, and was incorporated with the Borough of Northampton by an Extension Order granted in 1900. In 1884 plaintiff, in pursuance of the powers conferred on them by section 19 of the Northampton Water-Works Act, 1882, purchased the undertaking of the Water Company. Plaintiff's rate for a supply of water for domestic use was based on section 36 of the Act of 1884, which empowered them to charge a sum not exceeding 7½ per cent. per annum on the net rateable value of dwelling houses. Until June 24, 1901, defendant had paid a water-rate of 7½ per cent. on the net rateable value. In 1900, the boundaries of the borough of Northampton were extended by taking in Kingsthorpe. From 1861 to the present time the rates levied in the added part of Kingsthorpe (other than water-rate) had amounted to 5s. 6d. in the pound. In pursuance of the powers contained in the Acts and Order, the plaintiffs, until June 24, 1901, continued to demand a water-rate of 7½ per cent. from the defendant and all other domestic consumers, both in the old borough and the added parts. On and after June 24, 1901, plaintiffs reduced the water-rate from 7½ to 5 per cent. in the case of consumers within the boundaries of the old borough, but retained the 7½ per cent. in the case of those who were in the added part. The differentiation of the water-rate was effected by the plaintiffs in accordance with a recommendation adopted by the Town Council "to reduce the charge of 7½ per cent. upon the rateable value to 5 per cent.; the deficiency to be met out of the district rate. As the district rate for this purpose will only be chargeable within the old borough, it is obvious that the reduction ought to apply only to the old borough until such time as the rates on the newly added portion cease to be differential. It is estimated that this reduction will leave a sum of about £3500 to be contributed out of the district rate of the old borough." The plaintiffs stated that they deemed it equitable to effect the reduction on the ground that the large amount of property in the borough which was rateable to the poor and district rates and which benefited by the presence of an adequate public water supply for fire extinguishing and sanitary purposes, did not pay anything towards the cost of the water undertaking, as the owners and occupiers of the property did not in respect of the same take the water supply of the plaintiffs. As a means of enforcing contribution from owners and occupiers, the plaintiffs had adopted the reduction so that owners and occupiers within the old borough would, by their contribution, have to make good any deficiency created by the reduction of the water-rate. In the added parts, there were a number of residents who did not take the plaintiffs' water supply for domestic purposes, and whose property was not therefore subject to the payment of water-rate. Plaintiffs contended that they were entitled to refrain from reducing the water-rate in the added parts from the 7½ per cent. now levied, inasmuch as the ratepayers in the added parts being privileged from an increase in the district-rate for a period of ten years, the ratepayers would bear no part of the extra burden that might be thrown upon the district-rate of the old borough by reason of any deficiency resulting from such reduction. The defendant contended that the water-rate was a rate within the meaning of section 36 of the Provisional Order, and that, inasmuch as the poor, borough, and general district rates payable by him amounted together to 5s. 6d. in the pound, the plaintiffs were not entitled to recover the £1 0s. 3d., or any other sum, in respect of water. Secondly, the defendant contended (in the alternative) that if he was chargeable with a water-rate, the plaintiffs were not authorized to demand of him a higher rate than that demanded in respect of domestic consumers in the old borough taking a similar supply. Defendant's contention was that the differentiation of the water-rate as effected by the plaintiffs was contrary to the terms and intention of the Northampton (Extension) Order, 1900; that it was not authorized by the Acts of 1861, 1882, or 1884; and that such differentiation was in breach of the general law. He claimed that the plaintiffs were bound to place all domestic consumers in the borough on an equality.

Mr. SHIRESS WILL, K.C., and Mr. DISNEY appeared for the plaintiffs; Mr. HORACE AVORY, K.C., and Mr. CAMPION for the defendant.

Mr. SHIRESS WILL, having read the special case, submitted that the water-rate was not a rate made by the Corporation at all—that it was not a rate *ejusdem generis* with the other rates.

His LORDSHIP said it struck him as odd that the Corporation should have power to assess one house at 7½ per cent. and the next at 5 per cent.

Mr. SHIRESS WILL said he was not contending for anything of the kind.

His LORDSHIP asked who was to take into consideration the question of circumstances.

Mr. SHIRESS WILL replied the taxing body—the Corporation.

His LORDSHIP said it came to this, that if the Corporation could honestly see a reason for making a different charge, they might charge different rates.

Mr. AVORY said they might charge the milkman more, because he was supposed to use more water.

Mr. SHIRESS WILL said his contention was that the outside district was differently circumstanced to the old borough, inasmuch as it could not be charged for any deficiency which might arise; whereas the old borough could, and must be, charged with the deficiency.

Mr. AVORY submitted that "water-rate" was a rate within the meaning of section 36—that the other rates mentioned in the clause were exhaustive of the ordinary rates levied in a borough, and the words "any other rate" to have any application at all must be applied to this. The Order was made in 1900. The Corporation acquired the water-works under the Act of 1884; and as they had been levying the water-rate for six years, it was reasonable to assume that the water-rate was excluded. The Local Authority had no more power than the Water Company to charge a different rate for the supply of water for the same purpose, unless Parliament expressly authorized it, as in cases where the physical situation was such that pumping was more difficult. If 5 per cent. was a proper charge in any part of the borough, then it must be a proper charge for the whole borough. The effect of making a different charge was this, that if there were a loss on the water undertaking by the reduction to 5 per cent., the ratepayers in the old portion of the borough, who did not take the water, were made to pay. This was an illegal thing, as the Act of Parliament only gave power to charge those who took the water. On the other hand, if there was a profit on the water undertaking, the profit went to the district borough, which was fed by the district-rate; and the ratepayers in the added portion were paying more than was necessary in the shape of district-rate. Upon the third point, he submitted that the Corporation were not entitled to create a deficiency for the very purpose of making those who did not take a supply pay.

His LORDSHIP, in giving judgment, said the first question depended entirely on section 36 of the Act of 1884, under which the Corporation acquired the water-works undertaking. This section empowered the Corporation to charge for the supply of water for domestic use to any dwelling house a sum not exceeding 7½ per cent. per annum on the net rateable value as ascertained by the valuation list. It had been suggested that the Corporation might take into account the different circumstances under which different houses in the borough were placed, and might make a distinction in the rate charged. Now it appeared that some time ago the limits of the borough were extended, and the Corporation thought they had discovered that the houses in the acquired districts got the benefit of the use of water for certain purposes, such as extinguishing fires, at a much less price than the people who resided in the old district. They thought, therefore, it was right—and perhaps, in a sense, it might be—that they should obtain from the new district a greater district-rate than was obtained from the old borough. The question was, had they any right to do that? He did not think they had any such right. Section 36 was perfectly plain. It meant that a rate not exceeding 7½ per cent. over and above should be charged, that no distinction should be made between houses—that there should be a rate over the whole borough, which rate was not to exceed 7½ per cent. The next point was whether the water-rate was to be included

in ascertaining whether the maximum of 5s. 6d. in the pound had been arrived at. In his opinion, the water-rate was not included, as it was not a rate within the meaning of section 36. The water undertaking was acquired by the Corporation in 1884; the Order being made in 1900. So that, at the time the Order was made, the water-rate was already in existence; and if the Legislature had intended the water-rate to come within the meaning of the words "any other rate," it would have mentioned it. The Legislature did mention poor-rate, borough-rate, and district-rate, but did not mention water-rate. Why not? Because it was not a rate of the same kind as the rates with which the clause was dealing. The water-rate was the price paid by those who used water; and the mere fact that it was called a "rate" did not make it a rate within the meaning of the clause. It was very much like the rate paid for gas, except that in that case one was charged at per meter. In his opinion, this was not a rate to be taken into consideration in making up the 5s. 6d. The third question would be answered in the negative. The result was that judgment would be entered for the defendant with costs.

Monday, Aug. 4.

Colwyn Bay and Colwyn Urban District Council v. Conway Rural District Council.

This was a special case stated by an Umpire, asking the opinion of the Court upon a question arising under a Provisional Order which provided for the establishment of a Joint Water Board in Wales. It appeared that in 1891 three adjoining local authorities in Carnarvon procured themselves to be formed by a Provisional Order into a joint water-supply district, under the name of the Conway and Colwyn Water Supply District, for the purpose of providing water for the common use of the three districts. The Joint Board brought water to the boundary of the districts. After an interval of a few years, they proceeded to lay new mains through the district of the Colwyn Bay Urban District Council, and a dispute arose between the three constituent bodies, upon which there was an arbitration before Mr. Balfour Browne, who made an award, the effect of which was that this new main was not a main for the purpose of the Joint Board, but was a main for the purpose of the Colwyn Bay Urban District Council. This main was paid for, and maintained by, the Colwyn Bay Urban District Council, and only provided water for distribution in the plaintiffs' district. But it delivered water into part of the district of the Conway Rural District Council; and the question was whether this body ought to pay something to the plaintiffs in respect of maintenance. The Umpire was of opinion that they ought so to pay; and he assessed the amount at £40 a year. The question for the Court was whether this sum, or anything, was payable.

His LORDSHIP said when the matter came before Mr. Balfour Browne, he decided that so much of the new main as ran through the plaintiffs' district should be paid for by them, not by the common fund, and that so much of the main as ran through defendants' district should be paid for by the defendants; but nothing was said as to who should pay for the maintenance of these two stretches of main. The parties acted in accordance with the award—each paying the cost of maintaining the pipe within its own boundary. But it was now urged that the defendants ought to contribute to the maintenance of that part of the main which was in the plaintiffs' district, because the main carried the water into the mains in the defendants' district. There might be some reason for saying that a service of some kind was rendered by the plaintiffs to the defendants in carrying the water; but he could find no implied request by the defendants to the plaintiffs to expend money in keeping the main in repair. There certainly was no express request for this to be done. The work was really done by the plaintiffs for their own benefit. It did happen no doubt that in doing the work the plaintiffs kept the main in order through which water passed to defendants' district; but the fact that the defendants in this indirect way benefited by work done by plaintiffs for their own benefit did not justify the present claim. Indeed, his own notion was that when Mr. Balfour Browne ordered each to pay for the stretch of main in its own district, he meant and intended that each should not only pay the original cost, but the cost of maintenance. Under these circumstances, the judgment must be entered for the defendants, with costs.

Welsbach Litigation in Australia.

In the "JOURNAL" for the 8th ult. (p. 89), it was announced that the Australasian Incandescent Gaslight Company, Limited, had obtained a perpetual injunction and damages against a Mr. Brown, of Melbourne, for infringement; a certificate of validity of their 1894 patent (equivalent to the 1893 British Welsbach patent) being granted. From further particulars which are now to hand, it appears that the defendant denied that the mantles in which he dealt were an infringement of the plaintiffs' patent, and pleaded that the plaintiffs were not the legal owners of the patent. He further contended that there was no novelty in the invention, which had been in public use in Australia since 1886. Mr. Justice A'Beckett, before whom the action was tried in the Supreme Court of Victoria, in the course of his judgment, said that the first matter to consider was whether infringement had been proved. Evidence as to this had been given by Professor Masson, who had analyzed a portion of one of the mantles sold by the defendant, and stated that it contained ingredients as described in the plaintiffs' specification. This was sufficient to prove infringement of the patent by the defendant. The defence of prior user had not been made out; and the onus was on the defendant of substantiating that defence. On the question of want of novelty by the publication of an earlier patent, the Judge held that the defendant had not sustained the objection raised. The interim injunction which had previously been granted was therefore made perpetual. There was no order for accounts; the defendant consenting to damages being fixed at £5. Judgment was accordingly entered for the plaintiffs with costs; and a certificate was given that the validity of the patent had been in question.

MISCELLANEOUS NEWS.

REGULATING THE SUPPLY OF WATER GAS.

Bill by the Board of Trade.

As will be seen by our "Parliamentary Intelligence," a Bill has been introduced into the House of Lords for the "regulation of the supply of water gas and other poisonous gases." It was presented by the Earl of Dudley, the Parliamentary Secretary of the Board of Trade, and read the first time, on Tuesday; and it has since been issued. It consists of two clauses only, as follows:—

1.—(1) The Board of Trade, after consultation with the Local Government Board and the Secretary of State, may make regulations with respect to the supply of any water gas or any poisonous gas other than ordinary coal gas, and may by those regulations—

(*a*) Prohibit, either absolutely, or during certain hours, or subject to certain conditions, the supply of any such gas containing more than a specified proportion of carbonic oxide.

(*b*) Provide for notice being given to consumers before any water gas or poisonous gas other than ordinary coal gas, is supplied.

(*c*) Provide for tests being made of the amount of carbonic oxide contained in any gas supplied, by gas examiners appointed under the Gas-Works Clauses Act, 1871.

(*d*) Require the odorizing of any water gas or poisonous gas other than coal gas, in such a manner as to betray its presence in any room where unconsumed.

(*e*) Give powers to inspectors of factories and inspectors of mines to enforce the regulations as respects any factory, workshop, or mine, and for that purpose may apply any provisions of the Factory and Workshop Act, 1901, or the Coal Mines Regulation Act, 1887, or the Metalliferous Mines Regulation Act, 1872.

(*f*) Make such other provisions as appear expedient for carrying those objects into effect.

(2) Regulations made under this Act may be either general regulations applying to the supply of water gas, or poisonous gas other than ordinary coal gas, by any company or authority, or special regulations applying to the supply of any such gas by any particular company or authority; and any such general regulations may be modified as respects any particular company or authority by special regulations.

(3) Any regulations made under this Act shall apply, whether the water gas or other poisonous gas is supplied by itself or mixed with any other gas.

(4) If any person fails to comply with, or acts in contravention of, any regulation made under this Act, he shall be liable, on summary conviction, in respect of each offence, to a fine not exceeding twenty pounds, and, in addition, to a fine not exceeding five pounds for each day on which the offence is continued after conviction therefor.

(5) Section 1 of the Rules Publication Act, 1893, shall, notwithstanding anything in that section, apply to regulations made under this Act.

2.—This Act may be cited as the "Gas Regulation Act, 1902."

REPORT OF THE CHIEF INSPECTOR UNDER THE ALKALI ACTS.

The report for the past year of the Chief Inspector under the Alkali, &c., Works Regulation Acts, 1881 and 1892 (Mr. R. Forbes Carpenter) was issued on Thursday—a few weeks later than that for the year 1900. As usual, it contains much matter of interest to our readers; and we therefore commence to-day an abstract of its contents.

The number of works now registered under the Act in England, Ireland, and Wales is 1036. Of these, 83 only are works decomposing salt, and so scheduled as alkali works; while the remainder carry on processes which are scheduled under the Acts of 1881 and 1892. These numbers show a reduction of 2 alkali and of 16 scheduled works. There are also 125 works registered in Scotland; bringing up to 1161 the total number of works in the United Kingdom. The report on Scotch works is presented to His Majesty's Secretary for Scotland. The Inspectors under the Acts paid 5013 visits to works, and carried out 5204 tests, compared with 4989 visits and 5431 tests in the year 1900. Mr. Carpenter expressed satisfaction at being able to report that no proceedings were entered last year for the recovery of penalties provided in the Act for the infraction of the limit clauses, or for failure to use the best practicable means for preventing the escape of noxious and offensive gases. This result, however, in two particular cases, was only reached by the suspension of the severer measures pending the immediate remedying of the causes that gave rise to most serious complaint. No cases were reported of culpable neglect in failing to apply for registration of operations scheduled under the Acts.

In April last year, a Bill was introduced into the House of Lords to amend the clauses of the Act of 1881 relating to sulphuric acid. The measure was read a second time in the House of Commons on the 22nd of July; but, as no time for the Committee stage of an opposed measure could be allotted by the Government, the Bill was withdrawn on the 15th of August. As, on the introduction of the Bill, considerable misconception existed in the minds of several manufacturers, and, strange to say, almost exclusively in the minds of those who had been subject to inspection as regards the manufacture of sulphuric acid from 1875 onwards, Mr. Carpenter makes a short statement as to the objects and scope of the Bill, and the necessity for its introduction. He shows that the objects were: (1) To state, without the possibility of doubt, what were the gases in which the amount of the acid gases of sulphur

and nitrogen was to be ascertained, and where the limit of acidity was to be applied; and (2) to define equally explicitly in regard to hydrochloric acid and acid gases of sulphur and nitrogen, the provisos protecting the manufacturer from undue pressure by the Inspector under the "best practicable means" clause. The scope of the measure was strictly confined to this; no fresh principle of legislation being introduced, and no increase of stringency imposed.

Mr. Carpenter opens his remarks upon the manufacturing operations coming under his supervision with an account of the alkali and wet copper works. These, however, may be passed over, as may those referring to chlorine. We then come to the alkali waste works, in regard to which he says it is again unsatisfactory for him to have to state that in the Chance-Claus process no successful method of utilizing the residual gases from the "flowers" chamber has yet found place in any works. Hitherto the supervision of the process has been largely directed to preventing escape of sulphuretted hydrogen into the atmosphere. The conversion of this into sulphurous acid has been considered to be the first step in the direction of subsequently utilizing the sulphur escaping, partly as sulphurous and partly as sulphuretted hydrogen, from the process fully 12 to 15 per cent., in many cases, of that extracted by the Chance process from the alkali waste. One proposal, which has received the protection of a patent, has been to convert the sulphurous acid so obtained into sulphuric acid by some form of catalytic or contact process. Experiments on the small scale were conducted which seemed to promise favourably; and it was also experimentally proved that the oxidation of sulphuretted hydrogen could be made absolutely complete in a special form of close furnace. Any residual unconverted sulphuretted hydrogen would, it is known, exercise a most prejudicial effect on the activity of the contact substance. The matter, however, rests here; financial considerations of cost of plant, &c., not proving favourable to further development. At the close of the year, Mr. Carpenter directed the attention of users of this process to the experiments conducted in his laboratory in 1899 on the use of Weldon mud as the contact substance in the Claus kiln. He thinks the conclusion is justified, from the experiments there recorded and confirmed by recent tests of a working plant on the manufacturing scale, that at the lower temperature at which manganese oxide is active, as compared with ferric oxide, in reducing the reaction—

$$H_2S + O = H_2O + S$$

there is not the tendency for sulphur so separated to oxidize to sulphur trioxide with excess of air present, still less for the counter reaction to start—

$$3S + 2H_2O = SO_2 + 2H_2S$$

In the succeeding sections of the report, the Chief Inspector deals with sulphuric acid works, sulphuric acid concentration, and chemical manure works; and then he comes to a group of works more closely allied to the gas industry—viz., those for the manufacture of sulphate and muriate of ammonia and the treatment of gas liquor. In his previous reports, he has dwelt in such detail upon the various methods adopted for complying with the requirements of the Act of 1881 concerning these scheduled manufactures, that he does not discuss at great length what may be called the older standard methods. As regards the utilization of the sulphuretted hydrogen for conversion into sulphuric acid in the vitriol chamber process, the experience in the largest works has continued to be uniformly satisfactory except in one instance, where, on going closely into the working of the process, it was found that the distillation of gas liquor with evolution of foul gases was, for economical conversion, proceeding at a rate quite out of proportion to that of the production of sulphuric acid from the regular source of sulphur—pyrites. When this proportion became normal, difficulties ceased. The rate of evolution of gas could be varied within very wide limits, as the still had great capacity, and economy in steam had been found to result from working the distillation process at maximum pressure. This flooded the vitriol chambers for the period of such working with a gas weaker in sulphurous acid than usual, and consequently with uneconomical results. In his report to the Secretary for Scotland, to be noticed in a subsequent issue, Mr. Carpenter sets out the results of an examination of the Claus process modified to deal with gasses poorer in sulphuretted hydrogen than is usually the case in English works. The knowledge gained, moreover, throws some light on the reaction proceeding in the kiln, which may be of service to some who experience difficulties with gases approaching the lower limit of efficiency, as hitherto understood—viz., about 15 per cent. of sulphuretted hydrogen in the foul gases as calculated from the gas liquor. It may be somewhat lower in practice, as some sulphuretted hydrogen is withdrawn in the "devil liquor" during the process of cooling the gases prior to introduction into the kiln.

In his report for the year 1900, Mr. Carpenter devoted some space to setting out the results of laboratory examinations of the reactions that might be expected to occur in Mr. H. Hemingway's process for the removal of sulphuretted hydrogen from the foul gases evolved in sulphate of ammonia manufactured from gas liquor, by the use of sulphite of iron. Mr. Hemingway has since pointed out to him that the statement as to what took place in the laboratory experiments which "showed that a material loss of sulphur takes place through formation of thiosulphate, the sulphur in which is lost as far as the process is concerned," was not applicable to what took place on the larger scale of a small working experiment, where he found that thiosulphate of iron was fully as efficient as sulphite in absorbing sulphuretted hydrogen from the gaseous mixture ascending his purifying column. When opportunity presented itself, therefore, experiments were resumed to study the reactions between thiosulphate of iron and sulphuretted hydrogen in aqueous solution, and, as before, these were conducted in stoppered bottles. The results were both unexpected and interesting, for the formation of bisulphide of iron in the wet way is one of very infrequent occurrence. Taking the sum of the reactions, starting with sulphite of iron and sulphuretted hydrogen, in such a tower as Mr. Hemingway described, a mixture of ferrous sulphide and bisulphide with free sulphur might be expected as the insoluble products at the foot of the tower. These, if collected on a filter-bed of pyrites smalls, would give a mass rich in sulphur, and, therefore, of use to the sulphuric acid maker; and the ferric oxide product of calcination would be in a state of fine division suitable for manipulation by the colour maker. Leaving the technical or commercial aspect of the question, Mr. Carpenter proceeds to deal at some length with the experiments carried out in his laboratory by his assistant (Mr. Linden), whose zeal and skill he warmly eulogizes.

We now come to the subject of the recovery and production of ammonia. Through the courtesy of manufacturers, the Chief Inspector is enabled to again present the figures which for several years past have formed an interesting feature of his annual reports—showing the produce of ammonia from all sources in the United Kingdom. They are contained in the following table:—

—	1901.	1900.	1899.
Gas-works	142,703	142,419	133,768
Iron-works	16,353	16,959	17,963
Shale-works	40,011	37,267	38,780
Coke-oven works	12,255	10,393	7,849
Producer gas and carbonizing works (bone and coal)	5,891	6,688	7,360
Total	217,213	205,720	213,726

It will be noticed from these figures that the most important contributor is, of course, the gas industry. The figures, however, show only a small increase over the corresponding ones for 1900—a result undoubtedly due to the erection of water-gas plants, which still continues in different parts of the country. According to the last returns, there appear to be, among the 693 gas undertakings, 51 companies and 18 local authorities from whose gas-works carburetted water gas is sent out in admixture with coal gas; the maximum proportion of such admixture in eight cases reaching or exceeding 50 per cent., and in 38 cases reaching or exceeding 30 per cent. Mr. Carpenter points out that had not carburetted water gas entered the field of gas supply, some indication might be gathered from the above figures and from the names of the gas undertakings where this process is in operation, of the nature of the increase that would have been shown in the ammonia produced in this industry. It is worthy of note that, taking Scotland separately, the production of ammonia in gas-works in England, Ireland, and Wales shows an absolute reduction of more than 100 tons calculated as ammonia sulphate, as compared with the same figures for 1900. In fact, it is Scotland's produce from shale distillation which this year reaches the remarkable total of 40,011 tons of sulphate, as compared with 37,267 tons in 1900. This again helps the total figures to show a substantial increase, as the sum of the produce from blast-furnaces, coke-ovens, coal and bone carbonizing, and producer gas shows an increase of 459 tons only.

Taking the individual items in the order mentioned above, the return from blast-furnaces—an industry almost exclusively confined to Scotland—shows a reduction of 606 tons. In coke-oven recovery plants, the full increase expected has not been attained owing to the depressed condition of the manufacture so intimately connected with the iron industry. The price of oven coke was lowered by this depression, while the price of coal was fairly maintained. Some plants were stopped by this abnormal position, for which, it is hoped, time will provide a remedy. There is, however, a substantial increase of nearly 2000 tons to record. In the last composite item, various causes have combined to give a temporary check to production. Mr. Carpenter thinks increase in the recovery of ammonia from producer gas may be looked for with confidence in the early future, as in various parts of the country, and notably in North Staffordshire, the Company formed to promote the erection of Mond producer gas plants have contracted to erect large installations with ammonia recovery.

The Chief Inspector reports additional progress, as the result of the past year's experiences, in the conduct of operations for the recovery of ammonia in connection with coke-ovens. At the Brymbo steel-works, where coke-ovens of the Semet-Solvay type have been for several years in successful operation, further improvements in details of working were made during the year which have the effect of minimizing any nuisance that is apt to arise during the charging and discharging of the ovens. The washed fine coal is moulded into a cake, before its introduction into the oven, in a compressor driven by an electric motor itself deriving its power from coke-oven gas through a Crossley Otto gas-engine with dynamo. Some 25 per cent. more weight of coal is got into the charge, with an ultimate gain of 10 per cent. in the produce of the oven—the denser charge taking somewhat longer to coke. The time of charging is shortened, as compared with the ordinary method of hopper charging from the top, with levelling of the charge by hand labour. This minimizes the low-level smother arising from incipient distillation by the hot oven walls of coal in contact therewith. In addition to the work of compressing and charging the cakes of coal, the gas-engine above referred to supplies energy for other operations, such as the coke-discharging ram, elevators for washed slack, hoists, fans, pumps, &c.—in fact, the whole subsidiary service of the steel and iron works (repair shops, cranes, &c.) is supplied in this way. Other gas-engines of the Westinghouse type are erected, or are in course of erection, for utilizing coke-oven and blast-furnace gases directly. More perfect control of the heating of the ovens has been obtained by severing the chimney draught and coupling up the oven flues to a fan of which the speed can be controlled at will. The time of carbonizing is more regular—the draught not being at the mercy of frequently tempestuous winds.

With regard to works for the distillation of tar, Mr. Carpenter confines himself to referring to the particulars to be found in the reports of the District Inspectors as to the improvement made in dealing with the foul gases from the worm-ends of the stills, and with the vapours arising from the discharge of melted pitch to the bags. In the course of the current year, more plants of the continuous type may be expected to start operations.

The report concludes with an extract from the address of Mr. J. W. Swann, F.R.S., to the Society of Chemical Industry last year, in which he dwelt on the future of electro-chemistry. We give the following

portion, for the sake of the interesting table compiled by Mr. Swann to show the total power available in 50 works in Europe for electro-chemical and electro metallurgical industries.

One of the largest questions brought into view by the prospect of a more extended use of electro-chemical processes, with their immediate dependence on power for the generation of electricity, is that of the position of those countries which possess coal, but do not possess waterfalls. Unfortunately, though we have an abundance of coal, we have very little water in the form available for the economical generation of motive power. Therefore the question comes home to us, whether, with coal only, we can carry on electro-chemical industries with profit, in competition with the countries which possess a large supply of easily engineered water power.

The question is complicated in many ways. In the first place, it is necessary to find what is the cost of power developed by coal, and what the cost of power developed by water. The cost in neither case is uniform. The cost of water power and that of power generated by coal both vary exceedingly, under different conditions. It is even a fact that water power in some cases (no doubt exceptional ones) is more expensive than the power obtained from gas or steam.

The difference in cost in different circumstances is extremely great. From data gathered from many sources, I find that there is one place (it is in Norway) where power is generated at a cost of 20s. per horse-power-year. This cost is chiefly interest on capital expenditure on the works. But, on the other hand, there are cases where water power costs ten times, or more than ten times, this amount, The capital outlay at Lyons has been £84 per horse power developed, as compared with £3 9s. 3d. at Vallorbe, in Switzerland. Niagara power is a mean between high and low water-power costs. There the charge to large consumers is at the rate of £4 per electric horse-power-year.

Difference of cost is equally wide in the case of coal-produced power. I am informed on good authority that there are steam-power plants in operation in the United Kingdom which yield the power at a cost equivalent to £5 per electric horse-power-year; and certainly there are many where the cost will be twice, and even four times, this amount. Such figures are for power generation on a large scale (not less than 1000-horse power units), and also, of course, continuously and uniformly delivered. One other essential condition for obtaining a low cost for steam power is obviously low-priced fuel. In the case where the electric horse-power-year is said not to exceed £5, fuel costs only 4s. 10d. per ton delivered at the boilers. But, notwithstanding the fact that, under extremely favourable conditions, electrical energy can be generated from coal at a comparatively low cost, the fact remains that the greater number of electro-chemical and electro-metallurgical plants are operated by water power; and in the table annexed you will find the results of my own inquiries on this point. Summarized, the returns sent to me show that 50 works in Europe (only one-third of those existing) have 149,000-horse power available from water, 16,700-horse power from steam, and 250-horse power from gas.

Country.	No. of Works.	Horse Power Available.			
		Water.	Steam.	Gas.	Total.
United Kingdom	6	5,000	8,600	200	13,800
France	11	54,100	Nil	Nil	54,100
Germany	9	4,550	5,340	50	9,940
Switzerland	7	25,000	Nil	Nil	25,000
Norway and Sweden	4	25,200	,,	,,	25,200
Austria	2	9,218	10	,,	9,228
Italy	5	17,850	Nil	,,	17,850
Russia	4	2,000	2,760	,,	4,760
Spain	2	6,400	Nil	,,	6,400
Total.	50	149,318	16,710	250	166,278

Note.—Expressed as percentage of the total power, 89 per cent. is generated from water, 10 per cent. from steam, and less than 1 per cent. from gas.

In considering the bearing of these facts upon the actual position, it is to be borne in mind that the last word has not yet been spoken as to the cost of power developed by coal. Great advances have in recent years been made in the direction of reduction of cost, by improvements in the steam-engine, the gas-producer, and the gas-engine. In the best modern steam-engines, a heat efficiency of 15 per cent. is obtained. There is great reason for hope that help in the more economical generation of power for electro-chemical work may come from the further development of the gas-engine. Already much has been done, both in the improvement of the gas-engine and also in providing it with cheap gas. Our honoured Past-President, Dr. Mond, has made a valuable contribution in this direction. One of the drawbacks to the employment of gas-engines for large operations has been that they were not adapted for large units of power; but now engines of 500 and even 1000 horse power are manufactured, and work with successful results.

In subsequent issues of the "JOURNAL," we shall notice the reports of the various District Inspectors, which, as usual, are appended to that of their Chief.

CLACTON-ON-SEA GAS AND WATER SUPPLY.

The Past Year's Working.

The Engineer and Manager of the Clacton-on-Sea Gas and Water-Works (Mr. Sydney Francis) has presented to the Gas and Water Committee of the Urban District Council his report on the new works designed and carried out by him, and on the working of the undertaking generally, during the year ending March 31; and it has been adopted by the Council. We reproduce the following particulars.

Taking the gas-works first, we learn that the new steel telescopic gasholder, having a capacity of 200,000 cubic feet, was successfully completed and set to work in May last year, and has resulted in more economical working in the production of gas and greater regularity in the supply. The new retort-house, which is designed to contain six settings of seven retorts each, was completed, and two settings, with cellars, regenerative furnaces, and chimney 70 feet high, were constructed and put to work in November. Besides greatly increasing the capacity of the carbonizing plant, a large saving in the coke used for fuel has been effected. The house is also much cooler, healthier, and more comfortable for the men to work in. The walls of the coal-store were found to be in a very unsafe condition and were removed. In rebuilding, these were set farther back, and an additional piece of roof constructed; thus adding about 50 per cent. to the storage. The new 12-inch foul main from the new retort-house has been carried round on the walls of the coal-store to the old condenser, thereby greatly increasing the condensing capacity. The scrubber was completed in March last year, and has been working continuously and satisfactorily ever since—thoroughly removing the ammonia from the gas, and providing the liquor for the manufacture of sulphate of ammonia. The new sulphate house and plant were completed and set to work in August; and in the seven months to March there were manufactured from what was previously waste material 11 tons of sulphate of ammonia, yielding a net profit of £79 15s. 5d. The two new purifiers and lifting and travelling apparatus were completed and set to work in June. Oxide of iron has since been used instead of lime as a purifying agent; and besides more thoroughly purifying the gas, a saving has been effected of about £131 for the nine months the plant has been at work. A new oxide-revivifying shed has been constructed. With regard to the distributing plant, during the year 2280 yards of new mains were laid. The number of consumers on the 31st of March last was 803, against 717 in March, 1901—an increase of 86; and the number of cookers on hire was 387, against 208, or 179 more. Last August, 12 high-power lamps, giving a light of 300 candles with a gas consumption of 10 cubic feet per hour, were erected in various parts of the district with much success; and it was decided to borrow £500 and erect 57 more of these lamps on larger columns. In October, a shop was hired for the purpose of exhibiting gas heating-stoves and other appliances, as well as the latest systems of incandescent lighting; and it resulted in 55 gas-fires being let on hire. From June last year the price of gas for engines was reduced from 4s. 6d. to 4s. per 1000 cubic feet; and at Christmas the charge to ordinary consumers was also brought down to 4s.

Comparing the working in the past financial year with that for the twelve months ending March 31, 1901, we find the total quantity of gas made was 28,406,000 cubic feet, against 22,903,000 cubic feet for the previous year—an increase of 24 per cent. The gas produced per ton of coal carbonized was 11,042 cubic feet, against 10,906 cubic feet, an additional yield of 136 cubic feet. The gas sold per ton averaged 10,381 cubic feet, against 10,167 cubic feet, or 214 cubic feet per ton more. The sale of gas for the year ending March 31, 1900, was 9440 cubic feet per ton, and for the previous year about 8955 cubic feet; thus showing that for the year ending the 31st of March last the sale per ton of coal was 1426 cubic feet more than when the undertaking was acquired. The leakage last year was 5·98 per cent. of the make, against 6·77 per cent. for the preceding year—a reduction of nearly 1 per cent. The leakage for the year ended March 31, 1900, was 7·33 per cent. During the past year, coal cost an average of £1 1s. 1d. per ton, against £1 0s. 4d.—an increase of 9d. per ton, due to the fact that the coal for the first half of the year was bought at £1 3s. per ton before the drop in prices. This increase, on 2572 tons, equals £96 9s.

With respect to the other branch of the business, we learn that the supply of water was fully and constantly maintained throughout the year. Periodical analyses were made, and the water was invariably reported to be of excellent quality and purity. In May last year, 25 acres of land were acquired under the Act of 1898 on Moorlands Farm at Great Bentley. The Walton and Vista pumping-stations having been abandoned on March 25, 1901, it was necessary that a further supply of water should be at once obtained in their place. A shaft, 20 feet long by 8 feet wide, was sunk at a selected spot, and an abundant supply of water found; it being necessary while sinking the well to pump 80,000 gallons of water per hour to enable the men to work. This well was only taken down 20 feet, though the depth of water-bearing gravel on to the clay is about 30 feet. The Worthington pump and boiler from the Vista station were then fixed, and pumping started at 2.30 p.m. on the 12th of May; the water arriving at Clacton at 11.30 p.m. When pumping operations commenced, the level of water in the well was about 6 feet from the surface; and though this well had been used continuously for the Clacton water supply, with the exception of Sundays, from the start till the date of the report, the level had not been appreciably lowered. A total quantity of about 34,191,000 gallons had been pumped from this well up to the 26th of May. The expensive system of collecting culverts and wells was therefore abandoned; effecting a saving in capital expenditure of not less than £10,000. The water from Great Bentley has been frequently analyzed, and found to be a first-class potable water. The two existing sand filters have worked satisfactorily; but during last season they were worked to the utmost capacity, and it was determined to construct two additional larger filters, and also a concrete covered service reservoir to hold 500,000 gallons. It was decided to erect a new engine and boiler house, and fix therein a new Lancashire boiler 21 feet long and 7 feet in diameter, and a pair of Worthington low-service compound condensing engines, each capable of lifting to the tank 25,000 gallons of water per hour. During the past year, 2460 yards of new mains were laid. The number of consumers on the 31st of March was 1303, against 1262 in March, 1901. Mr. Francis estimates the total quantity of water supplied to the district during the year at 59,762,000 gallons; the average daily consumption being 163,731 gallons, and the maximum for one day 267,000 gallons—the year's consumption for all purposes averaging 21·6 gallons per day per head of the resident population.

Accompanying the report is a summary of the balance-sheets of the two branches of the undertaking. Taking the gas-works first, the total gross profit for the past year was £3259 9s. 3d.; and the balance from the previous year, £371 1s. 8d.—together, £3630 10s. 11d. The principal and interest paid amounted to £3131 3s. 10s.; leaving a balance of net profit to carry forward of £499 7s. 1d. The gross profit for the preceding year was £2674 6s. 11d.; and the principal and interest paid, £2957. The total gross profit on the water-works for the past year was £2071 14s. 3d.; and the balance brought forward, £468 18s. 10d.—together, £2540 13s. 1d. The principal and interest paid amounted to £2413 15s. 6d.; leaving a balance of net profit to carry forward of £126 17s. 7d. The gross profit for the previous year was £1961 9s. 4½d.; and the principal and interest paid, £2123 4s. 8d.

BRENTFORD GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Friday, at the Charing Cross Hotel—Mr. HOWARD C. WARD in the chair.

The SECRETARY (Mr. William Mann) read the notice convening the meeting; and the report and accounts—see last week's "JOURNAL," p. 357—were taken as read.

The CHAIRMAN said the report was not a very long one; but it showed that they had a sum of £71,550 available for dividend—and this without reckoning the reserve fund which now amounted to £15,162. Out of this £71,550, the Directors recommended that dividends be paid, subject to income tax, at the rate of 5 per cent. per annum on the preference stock, 12 per cent. per annum on the consolidated stock, and 9 per cent. per annum on the new stock, 1881. The report then went on to state that the business of the Company showed a continued and satisfactory increase—especially in the matter of the demand for stoves for cooking and heating purposes. There had been a clear increase in the sale of gas for the half year of 5 per cent. over the corresponding period of 1901, and there had also been a marked increase in the number of both ordinary and automatic consumers, the numbers being now 24,657 and 22,698 respectively, as against 23,237 and 20,971 last year. With regard to this increase, he would like to point out (as there had been some comments made by scientific journalists to the effect that the weather had very little to do with the consumption of gas) that, during the first three months of the past half year, the Company had had an increase of only 4 per cent. The reason of this was that the weather was very mild in January, February, and March. During the last three months of the half year, however, they had had an increase of 7 per cent.; and this brought the increase for the half year up to 5 per cent., which, of course, was very satisfactory. Turning to the accounts, and taking, first of all, the revenue account, they would see there was nothing very remarkable in it. They had had an increase in gas and meter rental of £7630, which was very good indeed. There was also an increase in the receipts from tar of £1098; and from ammoniacal liquor, of £267. Then they had a reduction in the cost of coal and oil used, of £9014. There was only one other item in the account which called for comment, and that was the great decrease there had been in the amount produced by the sale of coke. While they had a reduction in the cost of manufacturing material of £9014, they had a reduction in the amount received for coke of £9330. That, of course, was not very encouraging. The price of coke, he might mention, had averaged 10s. 9d. per ton, as against 15s. 10d. last year. He thought the experience of other companies was very much the same, except in the case of companies who had very good districts for the sale and consumption of coke. Taking it altogether, he believed there was a great demand now for small coal, which was very cheap indeed; and this militated against the use of coke. He was, however, very much in hopes that the activity of certain official people in reducing the smoke nuisance in the Metropolis would have the effect of compelling persons not to use small coal, though it was cheap, but to return to their former use of coke. Anyhow, the end of it all was that they had made £5000 more profit for the half year than they did in the six months ending June, 1901. They were enabled out of this to pay the dividend recommended, and they had a small surplus in addition. So much for the revenue account. There was an item in the capital account to which he wished to call their attention, because he thought it was an indication that the Board had taken very great care of the shareholders' money and their own. Of course, they were rather short of capital—indeed, very short—but during the half year they spent £22,666. Of this, £10,088 had been paid for new and additional meters and stoves. But by the system of writing off for depreciation of these goods which they had adopted now for some time past, they had written off £10,611; so that the meters and stoves—that was, automatic meters and stoves which stood in their books, and a great number of which had been put out on the district during the past six months—stood at a less amount than they did at the beginning of the half year, in spite of the additional number of customers. As to the paragraph in the report regarding the necessity for raising additional capital, he thought the shareholders would see in a moment that it was essential that this should be done. If they looked at the capital account, they would see that the balance of cash in hand at the end of June was less than £4000. Well, this was a very small sum with which to carry on a business like theirs; and if the shareholders glanced at the balance-sheet, they would be able to realize this. From it they would see that on June 30 stocks on hand (including coals and oil, coke and breeze, tar and other products, and sundry stores) amounted to no less than £40,953, in addition to which, of course, there were the accounts due to the Company for gas and meter rental and arrears outstanding of £51,977, or a total of £90,000 odd. If they took £40,000 from this £90,000, it left about £50,000 of business which they had done with a capital of less than £4000. The explanation of this was that they had a good large sum of undivided profits which were, of course, in the bankers' hands, and used by the Company as floating capital. In addition to this, they were occasionally obliged to get accommodation from their bankers. Though he was happy to say they did not owe them a penny at the present moment, still they were obliged sometimes to borrow; and therefore he thought the shareholders would see the necessity for the issue of some further capital in the near future. Before sitting down, he would like to mention one very interesting fact—and that was a comparison of the capital twenty years ago and to-day. At June, 1882, the capital per ton—that was, dividend and interest paying capital—was £8 5s. 5d. and a decimal; and the capital per 1000 cubic feet was 17s. 5d. To-day, he was glad to say, the dividend and interest paying capital per ton had been reduced to £4 14s. 8d.; and the capital per 1000 cubic feet had been reduced from 17s. 5d. to 9s. 7d. This was a very encouraging feature in the management of the Company. He concluded by moving the adoption of the report and accounts.

Sir RICHARD H. WYATT seconded the motion; and it was immediately carried.

On the proposition of the CHAIRMAN, seconded by Sir R. W. WYATT, the dividends recommended were declared.

A cordial vote of thanks to the Chairman and Directors brought the proceedings to a close.

BROMLEY GAS COMPANY.

The Half-Yearly General Meeting of this Company was held last Thursday, at the Bell Hotel, Bromley, under the presidency of Mr. ALEXANDER DICKSON.

The SECRETARY (Mr. H. W. Amos) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN said the chief point of interest on these occasions centred, he thought, round the one feature—the stability and growth of the business, upon which their prosperity depended. The increase of 3¼ million cubic feet in the make of gas for the past half year, as compared with the corresponding period of 1901, was therefore very welcome. On previous occasions they had had to remark upon the restrictive influence which warmer temperatures in the winter exercised upon the consumption of gas. Now they had an illustration of the converse—the augmentative effect which colder weather in the summer exercised upon the consumption. In the first four months of the past half year, the total quantity of gas consumed, as compared with the corresponding period of last year, showed a deficiency; but May and June, with their much lower temperature, had converted this deficiency into a gain. If the long period of unusually dry, warm, and clear seasons which they had been experiencing in late years was drawing to a close, as would now appear to be the case, it would probably be succeeded (as similar conditions had been succeeded in the past) by colder and more humid weather; and in this case lighting and heating would be much more in request. In both these respects, he thought the prospects of gas were quite as good as, if not better than, those of their competitors. There was, however, one thing which they did need to strengthen their position, and that was cheaper coal. It was not only disappointing, but partly incomprehensible, that they were unable to secure a greater reduction on their coal contracts for the coming year than the 1½d. per ton which was conceded to them. This was a very small reduction to get; but it was all that they were able to secure. The present circumstances led one to the conclusion that the bolstering up of the high prices of coal by the combinations among the owners, and by idleness enforced upon the workers, constituted a serious menace to the industrial interests of the whole community. He was very much interested (and he thought the shareholders also would be interested) in a report which he read a few weeks ago in one of the Newcastle papers of the annual gathering of the Northumberland miners. According to Mr. Boyle, their President, notwithstanding that 12½ per cent. had already been taken off, the rate of pay was still 26½ per cent. above the basis of 1879, and 3¾ per cent. above what the sliding-scale would have given on the same prices. The most impressive fact at that meeting was the statement of Mr. Fenwick, who was a representative member, that last year was a record one as regarded the number of men employed. There were 26,000 more men employed, he stated, last year than in the preceding twelve months, yet, he added, the output had decreased by 6 million tons. Mr. Fenwick might claim, as he then did, that this was a very serious thing indeed; for so it was from every point of view. It meant, he said, that they were having not only shorter time, but also, taken in conjunction with the great drop in the value of coals exported—namely, some £2,000,000—that they were getting less wages for the work they did. But behind all that, the following questions arose: If 26,000 more men output 6 million tons less in the year, has there been the same honest diligence for the day's pay as previously, and has work been continued with reasonable regularity? Further, it might be asked: Is the rate of pay still so high that holidays can be ordered to limit the output for the purpose of keeping up prices? If so, it would seem that the general community were being punished, or taxed to an unfair degree, by the miners, if not by the owners. The price of gas coal, free on board, was at present about 40 per cent. above what it was in 1898 and 1899, when the Company were charging 3s. per 1000 cubic feet for their gas. The Directors were most anxious to get back to this price as soon as they could possibly see their way clear; but the coal question was still with them. They had their duties to those who had subscribed the capital; secondly, they had certain outlays to make in the upkeep of the works, which must be maintained in efficiency; and, thirdly, the market for residuals was not then very assured. Under these circumstances, the Board might perhaps have claimed to be justified in continuing the price for gas the same as last year. But in the conviction that the truest interests of the Company were to be found in cheap gas, they had decided to reduce the price by 1d. per 1000 cubic feet as from Midsummer last. The Directors felt confident that this consideration of the consumers must bear good fruit; and they were equally sure that the shareholders would fully approve of the course taken. Since the last meeting, the Company had obtained further parliamentary powers under the Bromley Gas Act, 1902; and, to condense his observations, they had practically secured by this Act all that they really wanted. While giving power to raise a sum of £133,000 in new stock and mortgage or debenture capital, the Act also enlarged the mortgage capital allowed under the previous Acts by £14,000; and this was a very appreciable benefit to the Company, for they could raise the money at a lower rate of interest. They had now to provide, as would be seen from the accounts, a pretty substantial sum for working capital, owing to the necessity for procuring a stock of prepayment meters, fittings, and stoves for the use of those consumers who preferred this system; and the fact of the Company being able to raise this capital by means of debenture stock would make the burden easier. The proposals of the Board for the conversion of the shares into stock had

also been sanctioned. The explanation embodied in the report would doubtless have made it clear to all the proprietors that their interests had been preserved undiminished; and in lieu of shares they would receive stock, which they could sell or buy with greater facility, and which would bring them the better prices procurable for stocks carrying dividends more nearly in accord with the current price of money to-day, as compared with that of the past century. The Company's sliding-scale, with its standard price for gas and standard dividends—which was one of the earliest—had also been continued to them unimpaired. The reduction of the rate for excess dividends above the standard dividends was only proportional to double the nominal amount of the stock; the prescribed rate being now in respect of each half year, instead of the whole year as it formerly was. He might mention, in passing, that the consumers, as well as the Company, would moreover gain a material advantage, not only from this increase of the cheaper capital, but from the application of the revised sliding-scale to the new additional stock to be raised under this year's Act, inasmuch as the stock would only take 2s. 6d. per cent. per annum excess dividend, as compared with the 5s. on the old stock under the original Act. It had been contended that the new stock might produce less premium than the old, and that the benefit he had referred to would to this extent be minimized. But unless gas capital generally was to be permanently depreciated, or they were debarred from the accruing advantages of the sliding-scale, the average premium to be obtained on the new stock was not likely, all things considered, to be greatly less than that which was secured on the old; and in that case, the advantage was obvious, and beyond question. Practically, then, all the Company's proposals were sanctioned, with one exception, and this they decided to withdraw. He referred to the request for authority to apply the Company's funds in an application to the Board of Trade for powers under the Electric Lighting Acts. The Local Authorities at Bromley and Beckenham (who were the only opponents) had leased their powers subject to the right to take over the undertakings at certain stated periods; and they made it a condition precedent to the withdrawal of their petitions against the Bill that the Company should forego this clause. The Directors therefore deemed it expedient to agree to this; for they had no intention of competing with the Local Authorities for electric lighting in their own areas. By this settlement, the Company disposed of all questions between the Authorities and themselves, and avoided a long and expensive contest over a matter which offered, even had the Company been successful, very little advantage in return. He thought—in view of the strong criticism to which all applications by gas companies to Parliament were now subjected—that he might congratulate the shareholders upon having secured a new lease upon conditions which would enable their business to be carried on uninterruptedly for very many years to come. It did not, perhaps, lie with him to criticize the policy of the Local Authorities in having opposed the Company's Bill by general petition, and so compelled the Directors to go to the expense of supporting their case by professional evidence, without in the first instance having approached the Board—with regard to the matters in which they were interested, and had a right to be heard—so as to ascertain if any agreement was possible. That the Directors had effected a settlement while their Counsel was opening the case for the Bill, was some sign that the neighbourly considerations which then prevailed might have saved expense, had an opportunity been presented at an earlier stage. He merely referred to the matter by way of explaining the larger outlay incurred in obtaining the Act—which outlay would have to come upon the common pocket of the consumers and the Company. Turning to the accounts, it would be seen that these showed comparatively better results. In the first place, coal had cost £3933 less than in the corresponding half of last year, when the top prices were being paid. The cost of purifying material, wages, and repairs of meters was less by £141; and they also had an advantage of £210 by the absence of any serious law charges, and of £14 by fewer bad debts. Their total gain from diminished expenditure amounted to £4298. On the other hand, the outlay in the repair and maintenance of works, machines, retorts, &c., was larger by £765; on mains and services, by £134; on gas-stoves, by £152; on fittings on hire, by £119; on public lamps, by £67; on salaries, by £34; and on establishment charges, by £55. There were also three items of increase not usually recurrent. The first was the Auditors' fees, as last year, owing to a death, only one fee of £10 10s. was payable; the second was the payment of the remainder of the cost of the furniture for the new offices (£237), which was now entirely written off; and the third was £16 for interest on deposits for gas, which was now being brought into charge half yearly, instead of annually as was previously the case. This additional outlay represented £1636, giving an advantage on the expenditure side of the accounts of £2662. Then the price of gas had been reduced by 2d. per 1000 cubic feet as compared with the half year to June, 1901; so that, though they had sold more gas, there was on the whole a net diminution of £498 in the half-year's rental. There was also, by reason of a fall in prices, a diminution in the receipts from the sale of coke of £472, and, from similar causes, a decrease of £99 from tar and breeze; while the work done in fittings had been less by £19. Sulphate of ammonia, however, had produced a better return by £193, the rental of meters had increased by £50, and the rental of fittings and gas-stoves by £83. Rents and transfer fees were £5 better. The net decrease on the earnings was thus £757. The balance on revenue account to be carried to profit and loss account was £8665, against £6760 last year; and after deducting the payments for interest on loans, debenture stock, &c., the balance of profit and loss account stood at £9706, which would allow of the payment of the usual dividends and leave an undivided balance of £2978 to be carried forward to the next accounts. He was glad to be able to inform the shareholders that, as the result of negotiations, the Company had secured the public lighting for the Urban Council of the Chislehurst district; and the necessary work to prepare for this before the winter set in was being carried out. He concluded by moving the adoption of the report and accounts.

Mr. B. H. LATTER seconded the motion.

The CHAIRMAN, in reply to a remark by a shareholder, said that on previous occasions the Company had had a balance almost as large as the present one to carry forward, and that this balance came very fortunately to the aid of the Company when the price of coal jumped up, as it did, without any premonition.

The resolution was carried unanimously; and dividends were afterwards declared at the rates of 12 and 9 per cent. per annum on the different classes of capital.

Mr. ROLANDI made a suggestion that the Directors' fees ought now to be increased; but—it being generally preferred that notice be given to deal with such a question at the next meeting—the matter was not proceeded with.

A Special Meeting was subsequently held, at which it was resolved to raise by debenture stock a further sum of £10,000, part of additional moneys which the Company are authorized to borrow by section 18 of the Act of 1902.

On the motion of Mr. SUTTON, seconded by Mr. BURTT, a vote of thanks was accorded to the Chairman and Directors; and on the proposition of the CHAIRMAN a similar compliment was paid to the Engineer (Mr. W. Woodward), the Secretary (Mr. H. W. Amos), and staff.

CRYSTAL PALACE DISTRICT GAS COMPANY.

Half-Yearly Report and Accounts.

The report which the Directors of the above-named Company will present to the proprietors at the half-yearly meeting on Friday opens with an expression of pleasure that the result of the working in the six months ending the 30th of June was very satisfactory, following as it did a deficiency in the December half year, due to the reduction of 3d. per 1000 cubic feet in the price of gas (bringing it down to 2s. 7d.) from June. At this price the sliding-scale entitles the shareholders to a dividend of 5⅜ per cent.; but for the December half year only 5 per cent. was paid, for the reason that even this necessitated the absorption of the undivided balance and a little more. The position now stands thus: The profit on the revenue account is £21,432 14s. 10d. An adverse balance of £336 10s. 7d. on net revenue account has to be met; interest on temporary loans, &c., of £200 18s. 5d., and on the debenture stock of £2591 7s. 6d. has to be paid, also the dividend on the 5 per cent. preference stock of £1500. There then remains £16,803 18s. 4d. available for dividend on the ordinary stock. Believing that a dividend at the rate of 5¾, or £5 6s. 8d. per cent., can be maintained, the Directors recommend payment accordingly, amounting to £15,333 6s. 8d.; the odd 10d. of dividend payable, or £119 15s. 10d., being the difference between £5 6s. 8d. and £5 7s. 6d., will be added to the reserve fund, making it £38,034 12s. 2d., and the remainder (£1350 15s. 10d.) will be carried forward. It is explained that this favourable result is due to a variety of causes. Coal and oil cost less in the half year. But, on the other hand, the receipts for gas were necessarily less, notwithstanding the increase of more than 4 per cent. in the consumption; and the amount realized by the sale of residual products was lower. The feature, however, that gives the Directors the most satisfaction is the good service rendered generally—for, of course, there are some exceptions—by their officers and workmen, due largely to the Company's system of profit-sharing, whereby nearly all the employees have become shareholders, many of them holding considerable amounts of the Company's ordinary stock. Turning to the subject of incandescent lighting, the shareholders' attention is called to the fact that a great change for the better has taken place in the supply of burners and mantles. The Company joined a number of other companies and corporations supplying gas in an endeavour to obtain the removal of restrictions, and secure good mantles at a low cost. The Welsbach Company acted in a liberal and businesslike manner, and both objects have been attained. The Directors have undertaken to supply, renew, and maintain mantles for their consumers at a reasonable and definite charge per burner. Nearly all the public lamps supplied by the Company are fitted with mantles. The Directors conclude by expressing great regret at having to record the loss of two valued colleagues by death during the half year—Dr. Hetley and Mr. Bryan Donkin. Dr. Hetley faithfully and devotedly served the Company as a Director during the long period of 44 years; and Mr. Donkin, though only elected last year, was long enough on the Board to show what a zealous and valuable Director the Company have lost. The vacancies have been filled by (as already announced in the "JOURNAL") the election three months ago of Sir Fortescue Flannery, M.P., and more recently by the appointment of Mr. Charles Hunt.

The accounts accompanying the report showed that the expenditure for capital purposes during the half year amounted to £7679, chiefly for mains and services and additional gas-stoves. The total expenditure to June 30 was £763,788; leaving a balance of £15,702 unspent. The revenue from the sale of gas was £81,131; meter and stove rents produced £4532; residuals, £22,581; and the total receipts amounted to £108,254. On the other side of the revenue account, the manufacture of gas cost £70,320; distribution, £6640; and management, £3919—the total expenses being £86,822. The balance carried to the profit and loss account is £21,432; and the amount available for distribution is £18,303. Deducting the dividend on the preference stock (£1500), there remains the balance of £16,803 mentioned in the report. The statements relating to the manufacturing operations of the Company show that, under the supervision of Mr. S. Y. Shoubridge, 54,450 tons of ordinary coal, 160 tons of cannel, 234,379 gallons of gas oil, and 140 gallons of carburine were employed in the production of 584,480,000 cubic feet of coal gas and 96,842,000 cubic feet of oil gas—together, 681,322,000 cubic feet, of which 632,302,000 cubic feet were sold and 639,754,000 cubic feet accounted for. With regard to residuals, of the 658,404 cwt. of coke made, it is estimated that 175,162 cwt. was used in making coal gas, and 45,034 cwt. for oil gas; while of the breeze, of which there were 9132 yards, 801 yards were used for making oil gas. The quantity of coal tar produced was 587,105 gallons; and of oil tar, 20,842 gallons. Of ammoniacal liquor, there were 11,157 butts; and the quantity of sulphate of ammonia made was 496 tons.

TOTTENHAM AND EDMONTON GAS COMPANY.

Half-Yearly Report and Accounts.

A very satisfactory report has been issued by the Directors of this Company for presentation at the half-yearly general meeting next Saturday. The increase in the quantity of gas sold in the six months ending the 30th of June was 25 million cubic feet, or 8¼ per cent. more than in the corresponding period of 1901; and an addition to the business is in progress by the acquisition of the supply of gas to the Alexandra Palace, which has hitherto, by arrangement, been lighted by the Hornsey Gas Company. The accounts accompanying the report show that the revenue from the sale of about 330 million cubic feet of gas was £49,337, and that the residuals produced £8154—the total receipts being £62,034. The manufacture of gas cost £36,587; distribution, £8237; management, £2492—the total expenditure being £52,438, leaving £9596 to go to the profit and loss account. The balance available for distribution (including £4873 undivided before) is £12,206; and the Directors recommend the declaration of dividends, less income-tax, at the rate of 6 per cent. per annum on the consolidated stock, and of 4½ per cent. on the two "B" stocks. The payment of these will absorb £9210, and leave a balance of £2996 to be carried forward. Under the supervision of Mr. A. E. Broadberry, 17,890 tons of coal and 547,800 gallons of enriching oils were used in the production of 357,382,000 cubic feet of gas, of which 334,928,000 cubic feet were accounted for. The amount expended on capital account in the half year was £15,555, about £10,000 of which was for new buildings, works, and plant.

PROVINCIAL GAS AND WATER COMPANIES.

We commence to-day our usual notices of the reports presented at meetings of Gas and Water Companies in various parts of the kingdom.

GAS COMPANIES.

Airedale.

At the half-yearly general meeting of the Airedale Gas Company, held at Idle yesterday, the Directors reported that the quantity of gas sold in the six months ending the 30th of June was 17,745,400 cubic feet, or rather more than the sale in the corresponding period of the past year. The accounts submitted (probably the last to be issued) showed that the revenue amounted to £3634. and the expenditure to £2319; leaving £1315 to go to the profit and loss account. This allowed of the payment of the usual dividends at the rate of 5 and 3½ per cent., and the carrying forward of a balance.

Chester.

The half-yearly general meeting of the Chester United Gas Company was held last Thursday—Mr. J. Gamon in the chair. The Secretary (Mr. James Pye) submitted the dividend scheme, and stated that the amount standing to their credit was £3981 13s. 10d., and that the dividend of 2½ per cent. on the ordinary stock for the half year ended the 30th of June would absorb £3753 15s.; leaving a balance of £227 18s. 10d. to go forward. The Directors reported that the supply of gas showed a most satisfactory increase. The Chairman, in moving the adoption of the report, reminded the meeting that from July 1, 1901, there had been a reduction in the price of gas by 3d. per 1000 cubic feet, and said the increased consumption during the six months was as much as 7,400,000 cubic feet over that of the previous half year. They had done very satisfactory business; and the Directors were enabled to again build up the reserve fund. The bonus of the profit-sharing scheme had been brought into the accounts for the first time; and he was authorized by the Directors to announce that the Company would in the future allow a further discount of 1d. per 1000 cubic feet upon all accounts exceeding £10. He mentioned that £162 had been distributed among the workmen and other employees of the Company at the rate of 3 per cent. upon the wages earned between July 1, 1901, and the 30th of June last, and 13 officials and 52 workmen shared in the bonus. One condition of the agreement was that each workman should be insured in a benefit club of which the Directors approved. The Company had made some investigations, and found that several of the men belonged to clubs whose object was merely that of saving money so that they could get a division at the end of the year and have a good "spree." The highest bonus paid to a workman was £3 2s. 4d., and the lowest 8s. 6d. The report and accounts were adopted. The Chairman next moved the declaration of an interim dividend of 2½ per cent. on the ordinary 5 per cent. stock of the Company and the motion was agreed to.

Croydon.

The shareholders of the Croydon Commercial Gas and Coke Company are to meet on Friday, when the Directors will report that the quantity of gas sold during six months to June exceeded that in the corresponding half of 1901 by 4·75 per cent., and, notwithstanding the reduction in price of 2d. per 1000 cubic feet made at Lady Day last (representing a loss of revenue of £1354), the receipts from the sale of gas were augmented by £1515. The increase during the half year in the number of consumers was 819, and in stoves on hire 881. The receipts from the sale of residuals again showed a diminution, though a satisfactory feature was the improved result obtained from the manufacture of sulphate of ammonia. The various extensions and alterations of the plant at the works alluded to in the last report are now in progress; and it is hoped they will be ready for use during the coming winter season. It will be necessary to raise further capital during the present half year. After providing for all fixed charges, carrying £1000 to the reserve fund, and writing off £1000 in respect of the old Carshalton works, the amount available for dividends is £18,173, and the Directors will recommend dividends at the rate of 14 per cent. per annum on £51,600 of consolidated "A" ordinary stock, at 11 per cent. on £178,400 of "B" stock, and at 9 per cent. on the £35,000 of "C" stock and the £20,000 paid on 2500 Carshalton capital ordinary shares. These dividends will amount to £16,621, and leave a balance of £1551 to be carried forward.

Derby.

The accounts presented at the half-yearly meeting of the Derby Gas Company last Wednesday were of a highly satisfactory character; and the pleasure with which the Chairman (Mr. H. Swingler) submitted them to the proprietors must have been shared by Mr. J. Ferguson Bell, the Company's Engineer, to whose skilful management the results recorded were largely due. Mr. Swingler stated that the make of gas in the six months ending June 30 had been just over 300 million cubic feet, while the consumption had been 289 millions; being an increase of 4½ millions compared with the corresponding period of 1901. The Directors reduced the price of gas last October by 3d. per 1000 cubic feet, which caused a drop of £2620 in the revenue from this source. But the Company lately purchased the works of the Duffield, Allestree, and Quarndon Gas Company, and the increase in the consumption in consequence was 12½ per cent. in the half year. When they took over the works, they at once reduced the price by 10d. per 1000 cubic feet, bringing it to within 4d. of that charged in Derby. The Directors were well satisfied with the first six months' result of their progressive policy. A high-pressure gas-main had been laid to Duffield, in accordance with the agreement, and the new district would shortly be supplied from Derby; the intention being to discontinue the separate manufacture of gas at Duffield. The depreciation in the value of residuals had been a source of concern to most gas companies. The total sum received in the past half year, after deducting all expenses, had been £9636, compared with £12,191—a reduction of £2555, nearly 20 per cent., the chief items being a loss on coke of £2020 and on tar of £419. The total receipts on revenue account had been £48,549, compared with £53,607, being a drop of £5058 during the half year, chiefly due to the reduction of 3d. per 1000 feet in the charge for gas for lighting purposes, and of 5d. for motive power. On the expenditure side, the first item was coal. For the past half year it was very gratifying indeed to find the price had come down from £22,011 to £17,120, being a saving of £4891. This was accounted for in two ways—first, by a reduction to the extent of more than 3s. per ton; and, secondly, by the larger quantity of gas made and sold per ton of coal used, showing good and careful carbonizing. It would be appreciated more when he said that some 3000 tons less coal had been used in the past half year than in the first half of 1900, though considerably more gas had been manufactured. This large decrease in price and better working results enabled the Directors to place a very satisfactory balance-sheet before the shareholders. Rates and taxes had risen from £1948 to £2335, being an increase of nearly £400, chiefly due to a large advance in the rates. Referring to some observations which had appeared in the "Electrical Review" with regard to municipal electrical enterprise, the Chairman said he considered it was unfair that the Company should be called upon to assist the electric light works in the town, which, in his opinion, could be much better managed by private enterprise. Proceeding, he remarked that the total expenditure amounted to £35,081, compared with £39,146 for the corresponding six months of last year; showing a decrease of £4065. The profits amounted to £13,468, being a decrease of £1000. Despite this, he considered that the accounts were very satisfactory. The past six months had not been very good for gas companies generally, and in many cases it had been necessary to draw upon the reserve fund in order to pay a dividend at all, while in others it had been considered advisable to raise the charge for gas. In spite of the reduction in their price, and after the dividends had been paid, the Company would have £3000 to carry to the reserve account. The prospects of the Company were thus most satisfactory. The accounts were passed unanimously; and dividends at the rates of 10, 7, and 5 per cent. per annum were declared.

Dorchester.

At the half-yearly general meeting of the Dorchester Gas and Coke Company to-day, the Directors will report an increase of about 5½ per cent. in the consumption of gas in the six months ending the 30th of June, compared with the corresponding period of last year. Under the supervision of the Manager and Secretary (Mr. Frank Osmond) a new retort-house and regenerator furnaces have been completed and brought into operation. The quantity of gas sold was 15,733,400 cubic feet, producing a revenue of £3237; residuals brought in £725; and the total receipts were £4104. The expenditure being £2933, the profit realized was £1171. The balance in hand available for distribution is £1189; and the usual dividends on the ordinary and preference capital are recommended.

Grantham.

The half-yearly meeting of the Grantham Gas Company was held last Tuesday—Mr. J. G. Thompson in the chair. The report of the Directors showed the Company to be in a sound financial position, and stated that the Company had been able to place their coal contracts at a reduced price for the current year. A dividend for the half year at the rate of 5 per cent. per annum on the consolidated stock was agreed to. The Chairman referred to the price charged for gas, and said it was very moderate compared with other towns of the same size. The Directors hoped shortly to reduce the price of gas. The works had never been in such an efficient state; and for this they were greatly indebted to their Engineer and Manager, Mr. R. G. Shadbolt. Authority was given to the Directors to issue £25,000 of debenture stock to pay off the existing mortgage of £10,000, the loan at the bank, and leave a sum in hand to develop the undertaking.

Littlehampton.

The quantity of gas sold in the year ending the 30th of June by the Littlehampton Gas Company, Limited, as reported at the annual general meeting last Wednesday, was 34,735,000 cubic feet; being an increase of 5,331,000 cubic feet on that of the year 1900-1. The accounts (as audited by Messrs. Cash, Stone, and Co.) showed that the

sale of gas produced a revenue of £6504—prepayment meter supplies bringing in £1332; residuals brought in £1382; and the total receipts were £8515. The expenditure on the manufacture of gas amounted to £4989; on distribution, to £182; management cost £580; and the total expenditure was £6579. The balance carried to the credit of the profit and loss account was £1936; and the amount available for distribution £1830. Dividends of 5 and 3½ per cent. were recommended on the ordinary and preference shares; making, with the interim dividends, 10 and 7 per cent. per annum. Under the supervision of the Engineer and Manager (Mr. A. W. Elton), the works were kept in a condition to be fully capable of meeting the continued yearly increase of business.

Newport (Mon.).

Last Tuesday the half-yearly meeting of the Newport (Mon.) Gas Company was held—Mr. R. Langbourne presiding. The Chairman, in moving the adoption of the report and accounts, congratulated the proprietors on the results of the past half-year's working. As anticipated, there had been a reduction in the cost of coal, amounting to £3161; but that was qualified by a reduction in regard to the coke sold, of £2034, which would leave a balance of £1127. The amount for repairs and renewals, chiefly in the matter of retorts, was £431 more than the last half year. There was no other item calling for particular remark until they came to the rates and taxes, over which they had absolutely no control. This sum was £133 more than the corresponding half year. There was another item which he ought to mention perhaps, and that was the parliamentary expenses, £100. They had no control over this item, which was brought about by other parties seeking to interfere with their rights and privileges, and the Board were bound to defend themselves. The sales of gas were £1006 more than the corresponding half year; so that they were in a position to pay the statutory dividend without having recourse to the reserve fund. As promised, the Directors had considered the possibility of a reduction in price; and they had decided upon a reduction of 4d. per 1000 cubic feet in the price of gas net, without discount, as from Sept. 1. This, however, would not apply to places outside the borough, such as Caerleon, which was at present, he regretted to say, not a remunerative investment. They did not expect it to be. Still, they hoped that in the course of time it would become a valuable asset of the Company. The reduction would affect all ordinary consumers. They would note that there was a sum of £146 due to depositors in the Workmen's Thrift Society. He regretted to say this Society was confined to a comparative few of the workmen; the great bulk of whom were not of a saving character. The motion was carried, as was also one sanctioning the payment of the statutory dividend at the rate of 2½ per cent. on the consolidated stock, and the usual interest of 2½ per cent. on the 5 per cent. perpetual debenture stock for the past half year.

Poole.

The Directors of the Town and County of Poole Gas and Coke Company, Limited, reported, at the half-yearly meeting yesterday, that the working in the six months ending the 30th of June last had resulted in a profit of £1077, against £889 for the corresponding period of last year. The revenue from the sale of gas and the rental of meters was £4064; from residual products, £1140; and the total receipts were £5519. The expenditure on the manufacture of gas amounted to £3132, and the total expenses to £4442. The balance standing to the credit of the profit and loss account was £7660; and the Directors recommended the payment of the maximum dividends, less income-tax. Reference was made to the successful appeal against the increased assessment of the Company's works and mains, whereby a reduction from £1900 to £1524 was obtained; and also to the approaching amalgamation of the undertaking with the Bournemouth District Gas and Water Company, under the provisions of the Act of the present session. As the Poole Company will be wound up, the report presented yesterday was the last half-yearly statement the Directors will submit.

York.

The 116th half-yearly report of the Directors of the York United Gas Company, which was presented at the ordinary general meeting of shareholders last Thursday, set forth that the balance of revenue carried to the profit and loss account amounted to £8804 15s. 3d., and the interest from the reserve fund to £236 14s. 2d.; making a total of £9041 9s. 5d., out of which £403 16s. 1d. had been paid for interest on money borrowed on mortgage, and leaving a net profit of £8637 13s 4d. for the half year. The Directors recommended that the maximum dividend at the rate of 4 per cent. per annum should be declared on the consolidated ordinary stock, which would absorb £6952 18s. 4d.; leaving a surplus of £1684 15s. to be carried forward. The consumption of gas for the year ended the 30th of June last showed an increase of 2·65 per cent. over that for the preceding twelve months. The Directors stated that they had succeeded in making very favourable contracts for coal and oil for the ensuing year, which would materially reduce the cost of production. While the prices at which the Company were able to supply gas continued to be among the lowest in the country, they had decided that, under these more favourable conditions for production, they would reduce the charge for gas by 1d. per 1000 cubic feet, to take effect from the 30th of September next. The scale of prices will then be 1s. 11d., 2s., and 2s. 2d. per 1000 cubic feet, according to consumption. The Directors referred with regret to the death of Mr. Charles Sellers, who, during 52 years, had devoted his energies entirely to promoting the welfare of the Company.

WATER COMPANIES.

Cambridge.

Last Friday week, the half-yearly meeting was held of the Cambridge University and Town Water-Works Company. The Rev. Dr. Perowne (Chairman of the Board of Directors) presided. The Directors recommended a dividend for the half year on the consolidated stock issued under the Acts of 1853, 1855, and 1866, at the rate of 10 per cent. per annum, and upon the consolidated stock issued under the Act of 1886, and upon the amount paid on allotment, first, second, and third calls on new shares for the half year, at the rate of 7 per cent. per annum. The examination of the Company's water, both bacteriological and chemical, had been regularly made, it was announced; and the reports continued to be satisfactory. The Engineer and Manager (Mr. W. W. Gray) reported that during the half year water was laid on to 217 premises, the rental from which will be £224 per annum, and that the total number of premises now supplied is 16,378. The Chairman proposed the adoption of the report; remarking that it was satisfactory to the shareholders and to the public at large. Mr. G. W. Hattersley seconded the proposition, which was carried unanimously.

Leatherhead and District.

The half-yearly meeting of this Company, last Thursday, was presided over by Colonel Gleig, J.P., in the absence of the Chairman (Mr. John Boustead, J.P.). The report submitted stated that the receipts for the six months to June 30 amounted to £2794, and the working expenses to £1656, leaving a profit of £1138. To this had to be added £980, the amount brought from the previous half year, making a total of £2118. Deducting from this sum £161 interest on debenture stock, there remained £1957 available for division. The Directors recommended a dividend at the rate of 5½ per cent. per annum, which would absorb £969 and leave a balance of £988 to be carried forward. The report of the Engineer (Mr. F. S. Cripps), which was appended, stated that the supply during the six months had been satisfactory, both as regarded quality and quantity. The plant and machinery had been maintained in good working order and repair; and an adequate sum had been allowed for depreciation. About 2600 yards of new mains had been laid. The Chairman, in moving the adoption of the report and accounts, said the Board congratulated the shareholders on the prosperity and prospects of the undertaking. They were making very good progress, notwithstanding the fact that the accounts showed a smaller profit as compared with the corresponding period of the previous year. The reason for this smaller profit was that they had received less for meter supplies. The wet season had prevented people using much water for their gardens, &c.; and the result was that the return under this head had gone down. The supply by rating had increased, but not to a sufficient extent to make things even. Of course, concerns such as theirs were liable to these fluctuations, because in wet seasons the rain did for the gardens what in dry ones the water companies had to do for them. They had put on 52 new services during the period under review. A shareholder suggested that this loss on the meter supplies in wet seasons might be obviated by the Company charging a fixed sum per annum for watering gardens; and the Chairman replied that a change in the bye-laws had been made for this purpose. Considerable discussion also took place on the question of softening the water supplied by the Company. There is a feeling in Leatherhead that some steps should be taken by the Company to render the water more suitable for washing, &c.; while, on the other hand, the Board hesitate to incur the outlay necessary for this purpose. One of the Directors suggested that the consumers should soften the water themselves; but he admitted that this would only be practicable in the case of large establishments. However, a promise was made by the Board that the matter should not be lost sight of. The report was adopted, and the dividend recommended was declared.

Newcastle-on-Tyne.

Last Tuesday, an extraordinary general meeting of the Newcastle and Gateshead Water Company was held—Mr. W. D. Cruddas in the chair—for the purpose of raising further capital. The Company had, the Chairman said, incurred considerable expenditure, which had been met by temporary loans. To pay these off and to meet the further outlay necessary for the completion of the Catcleugh reservoir, the tunnel and aqueduct between Hallington and Whittle Dene, the Byker service reservoir, and other works, it became necessary to raise further capital. The called-up capital of the Company consisted of ordinary stock, £388,390, limited to a 10 per cent. dividend; ordinary stock, £320,005, limited to a 7 per cent. dividend; preference stock, £933,355, limited to a 5 per cent. dividend; and debenture stock, £509,949, limited to a 4 per cent. dividend—a total of £2,151,699. All the capital raised since the Act of 1889 had been issued as preference stock; and there had also been issued £280,000 of debenture stock. The Directors considered that the time had arrived when the ordinary capital should be increased. A resolution was submitted for raising the whole of the capital, under the Act of 1898, in the form of ordinary stock, with a dividend payable thereon in accordance with the Act, not exceeding 7 per cent. per annum, payable *pro rata* with the 10 per cent. stock. It was also proposed to raise the money authorized to be borrowed under the Act of 1898, £120,000, by the issue of 4 per cent. debenture stock. Regarding the new stock now to be raised, the average dividend which had been paid on the existing 7 per cent. stock for the first three years, had been at the rate of £5 19s. per cent. per annum; and this rate was being maintained for the current year. The proposals of the Board were agreed to.

York.

At the half-yearly meeting of the York Water-Works Company held last Thursday, the accounts presented showed that the revenue from the sale of water and the rental of meters amounted to £11,774, and that the total receipts were £11,854. Maintenance of works and plant cost £1999; management, £1048; rates, taxes, &c., £1727; and law charges, £64—making together £4838, and leaving a balance of £7016 to go to the profit and loss account. The balance available for distribution was £11,629; and the Directors recommended dividends on the ordinary shares at the rates of 10 and 7 per cent. per annum. They thought the time had arrived when the payment of a portion of the back dividends due to the ordinary shareholders might be made; and they suggested that 2 per cent. per annum on the ordinary shares, and 1½ per cent. per annum on the new shares (1878-1879), should be paid forthwith. The Company's mains were extended by 3500 yards, additional filtering plant was brought into operation, and between 9000 and 10,000 inspections of house fittings to prevent waste were made during the half year.

MANCHESTER CORPORATION GAS SUPPLY.

Annual Report and Accounts.

We have received from the Superintendent of the Manchester Corporation Gas Department (Mr. Charles Nickson) a copy of the report of the Gas Committee, briefly noticed last week, with an abstract of the accounts for the year ending March 31. The Committee record the progress of the undertaking as follows:—

The number of tons of coal and cannel carbonized, including the equivalents of enriching materials, and the quantity of gas and residual products made per ton carbonized, as compared with the previous year, is as follows:

	Coal and Cannel Carbonized. Tons.	Gas per Ton. Cub. Ft.	Coke per Ton. Cwt.	Coke for Sale per Ton. Cwt.	Tar per Ton. Gallons.	Am. Liq. per Ton. Galls. (10 oz.)
1902.	456,727	10,663	12·63	8·69	12·13	29·66
1901.	459,811	10,298	12·77	8·83	12·40	28·86

The quantity of carburetted water gas produced during the year was 795,045,000 cubic feet, compared with 676,303,000 cubic feet in the previous year. In the production of this gas, 2,846,940 gallons of oil and 16,476 tons of coke were used, compared with 2,464,607 gallons and 14,550 tons respectively for the year ending March 31, 1901.

The illuminating power of the gas sent from the works was equivalent to 18·54 standard sperm candles, against 18·97 candles for the year 1900-1.

The quantity of gas transmitted from the works shows an increase of 136,669,000 cubic feet, or 2·89 per cent., compared with an increase of 7,981,000 cubic feet, or 0·17 per cent., in the previous year. The total output and quantity unaccounted for, compared with the previous year, is as follows:—

	Gas Sent Out. Cub. Ft.	Unaccounted For. Cub. Ft.	Percentage of Loss.
1902	4,870,494,000	155,814,000	3·20
1901	4,733,825,000	130,761,000	2·76

The number of gas consumers on March 31, 1901 and 1902, was respectively as follows:—

	Within the City.	Beyond the City.	Total.
1902	110,085	26,835	136,920
1901	107,604	25,485	133,089
Increase in 1902.	2,481	1,350	3,831

The percentage of private consumption was as follows:—

	1901. Per Cent.	1902. Per Cent.
Within the City—Ordinary consumers	78·67	76·98
Prepayment ,,	5·42	6·42
Outside the City—Ordinary ,,	15·41	16·00
Prepayment ,,	0·50	0·60
	100·00	100·00

The number of automatic meters in use at the end of the financial year was 38,495, compared with 35,818 in the previous year—an increase of 2677, of which 2312 were fixed in the city and 365 in the out-townships. There were also fixed in connection with these meters 7873 grillers. The quantity of gas passed by these meters was 303,109,000 cubic feet—an increase of 51,767,000 cubic feet, or 20·59 per cent., on the previous year. These meters were inspected once in every five weeks; and the total amount collected from them during the year was £42,429 3s. 4d. This amount is represented by 10,183,000 pennies, weighing 90 tons 18 cwt. 1 qr. 16 lbs.

The number of gas-cookers and other appliances on hire on the 31st of March last was 12,930, and the number of gas-engines in use 1803, compared with 12,085 and 1604 respectively for the year ended March 31, 1901. The quantity of gas used by cookers, fires, and engines is estimated at 455 million cubic feet; being an increase of 12·34 per cent.

During the past four years, the increase in the consumption of gas has been as follows:—

	Cubic Feet.	Increase. Per Cent.
Year ending March, 1899	303,553,000	7·31
Do. 1900	268,771,000	6·03
Do. 1901	7,981,000	0·17
Do. 1902	136,669,000	2·89
Average	179,243,000	4·31

The following is a summary of the income and expenditure:—

Income.

	1901.	1902.
Gas sold, including stove-rents	£580,144	£648,735
Coke	86,096	62,137
Tar	27,826	23,887
Ammonia water	29,408	27,518
Sundry receipts	989	933
	£724,463	£763,210

Expenditure.

	1901.	1902.
Manufacture—		
Coal, cannel, and oil	£318,568	£332,771
Salaries, wages, and maintenance	145,657	138,076
Distribution—		
Salaries, wages, and maintenance	64,674	72,710
Management—		
Salaries and wages	4,300	4,438
Do. do. (collection)	9,543	8,848
General management expenses	8,273	8,228
Rents, rates, and taxes	43,043	44,030
	£594,058	£609,101

The cost of coal, cannel, and oil per ton carbonized was 14s. 6·86d., against 13s. 10·28d. for the previous year—an increase of 8·58d. per ton, which on the carbonization of 456,727 tons amounts to £16,328.

The gross profit on the year's working was £154,109 7s. 7d. The sum of £44,075 3s. 6d. was paid for interest, and £45,127 13s. 8d. has been placed to the sinking fund (as required by the Acts of Parliament under which the money is borrowed). The net profit, therefore, came to £64,906 10s. 5d. Of this amount, £50,000 was paid over to the city fund, £7015 1s. 10d. was applied in the extension of the carburetted water-gas plant, and the balance (£7891 8s. 7d.) has been placed to the contingent fund account.

The price of gas was advanced, in accordance with the resolution of the City Council of May 1, 1901, from 2s. 6d. to 2s. 9d. per 1000 cubic feet within the city, and from 2s. 9d. to 3s. per 1000 cubic feet without the city, as and from June 24, 1901.

The following table shows the expenditure on capital and renewals accounts;—

	Capital.	Renewals.
Gaythorn	£1,030 11 11	£3,045 15 5
Rochdale Road	8,092 4 3	223 17 5
Bradford Road	48,494 7 2	337 18 5
Droylsden	—	63 0 0
Street mains stores—		
Poland Street	3,707 13 6	17 17 11
Whitworth Street	659 9 11	—
Mains	7,733 18 6	8,634 3 3
Services	7,777 18 0	3,660 3 10
Meters	12,497 0 0	12,792 16 0
Stoves	7,439 13 5	611 10 3
Stoves show-room (Deansgate)	38 18 0	6 16 9
Oil storage depôt (Mode Wheel)	60 15 1	15 18 0
	£97,532 9 9	£29,409 17 3

The following extensions and renewals of works were carried out during the year.

Gaythorn Station.—The condensing plant at this station has been augmented by the erection of a set of water-cooled pipes which have been fixed on the existing condensing chamber. In addition, the six scrubbers adjoining the new washing and scrubbing plant are being adapted as further cooling power. The effect of these additions will be that the temperature of the gas can be more effectually controlled, resulting in its better purification. The new boiler plant erected on the site of the old boiler-house was completed during the year. It consists of four boilers—two 28 feet long and 7 feet in diameter, and two 27 feet long and 7 feet in diameter—carrying a working steam pressure of 80 lbs. per square inch. The feed water is delivered to the boilers through a Row's patent live-steam feed-water heater by a 6-inch double-ram pump. They are each fitted with Wilton's patent furnaces for the consumption of breeze. The re-arrangement of the steam-pipes throughout the works, rendered necessary by the concentration of the boilers, is almost completed. The four new boilers replace five old ones erected from 25 to 30 years ago, which had become unfitted for their work. A carburetting plant for the enrichment of the gas with benzol in place of cannel has been erected at this station, and will shortly be brought into use.

Rochdale Road Station.—The four new purifiers to replace the "A" section of purifiers are approaching completion, and will be available for use during the ensuing winter. They are the first erected in connection with this department on the dry-sealed principle, and are 45 feet by 40 feet, their working being controlled by Cutler's patent water-valves. The structure supporting the purifiers, valves, and roof is of steel throughout. Adjoining the purifiers, and under one roof, will be concentrated the whole of the washing and scrubbing plant. A new Kirkham washer-scrubber of a capacity of 4 million cubic feet per day has been erected, and the washers and scrubbers from other parts of the works will be placed alongside, enabling the gas in its passage to the purifiers to be passed in one, two, or three streams, as may be desired. This plant will be brought into use at the same time as the new purifiers. In connection with the reconstruction of the plant at this station, a considerable amount of work has been done during the year in the re-arrangement of the connecting pipes throughout the works. Good progress has been made with the new joiner's shop next to the smithy, which will be ready for occupation by the end of the year.

Bradford Road Station.—A tipping-engine for discharging coal has been supplied to this station, and has resulted in a considerable saving in cost in the handling of material, as compared with the old system of discharging by manual labour. The experimental gas-works erected at this station were brought into use during the year; and in future all the testing of coal, and other experimental work in connection therewith, will be carried out there. The sulphuric acid and sulphate of ammonia plants have been put to work successfully, and will be working under the guarantee of the Contractors (the Chemical Engineering Company) for a year. The four new sets of carburetted water-gas plant were worked during the winter; but before the full capacity of the eight sets—viz., 6½ million cubic feet—can be utilized, it will be necessary to provide the additional purifiers and tar settling-tanks which have been decided upon.

Droylsden Station.—At this station no extensions or renewals have been undertaken, with the exception of the usual renewals of retorts. For the first time in the history of these works, however, the plant was worked up to its full capacity during the past winter.

Street Mains and Lighting Department.—The total length of mains now laid is 1,449,127 yards, or 823¾ miles 207 yards; being an increase of 10¾ miles 187 yards during the year. The new workshops at Poland Street have been supplied throughout with the necessary machinery and fittings, and are ready for full occupation by the Meters and Stoves Departments. The experimental installation of intensified gas lighting on the Infirmary Esplanade worked satisfactorily throughout the year. A careful record has been kept of the cost of working, including a charge of 10 per cent. on the outlay, which works out to 1·64d. per 1000 candles per hour. A further installation has been erected round the new School of Technology in Whitworth Street, Sackville Street, and Granby Row, consisting of 27 hexagon lanterns, each containing three burners, giving an illuminating power of 24,300 candles. The compressors to give the increased pressure of gas are situated in the basement of the Technical School.

Stoves Department.—The following is a summary of the year's transactions compared with the previous year :—

	1901.	1902.
Number of articles sold	1320	1778
New stoves purchased for hire	2546	1212
Stoves issued on ordinary hire (including new stoves and re-issues)	4678	3886
Stoves issued on hire-purchase system	21	21
Stoves cleaned and repaired	1869	2608
Number of grillers fixed in connection with pre-payment meters	1817	5683

In addition to the usual renewal of retorts, the whole of the works and plant of the department have been kept in good repair and working condition, out of revenue.

Accompanying the report are the accounts, with the usual appendices, from which we take the following particulars.

REVENUE ACCOUNT.

INCOME.

Gas-rental—		
Ordinary meters		£551,625 6 10
Prepayment meters		42,429 3 4
Public lamps		47,880 0 11
Stove-hire		6,800 12 6
Residual products—		
Coke	£62,137 0 0	
Tar	23,887 4 7	
Ammonia water	27,518 5 2	
Carbon	583 1 7	
		114,125 11 4
Rents of cottages, &c.		349 8 8
		£763,210 9 7

EXPENDITURE.

Cannel, coal, and carburine (including cost of unloading, &c.)	£275,479 2 8
Carbonization (retort men's wages, &c.)	44,761 2 10
Retorts, fire-bricks, &c. (including cost of setting)	14,078 19 0
Repairs and maintenance of works, mains, &c.	74,385 3 1
Renewals of plant, &c.	29,409 17 3
Purifying material and wages	5,821 11 0
Carburetted water gas	72,712 14 9
Salaries and wages of clerks in superintendent's office, rental and inquiry offices, and meter inspectors	30,965 10 4
Collectors', receivers', and cashiers' salaries	8,847 16 3
Rents, rates, and taxes	44,030 4 10
Compensation under Workmen's Compensation Act, 1897	380 14 7
Bad debts written off	1,309 4 7
Miscellaneous expenses	6,919 0 10
	£609,101 2 0
Balance carried to the profit and loss account	154,109 7 7
	£763,210 9 7

PROFIT AND LOSS ACCOUNT.

Interest	£44,075 3 6
Sinking funds	45,127 13 8
Balance (net profit on the year's working)	64,906 10 5
	£154,109 7 7

The balance of net profit is applied as follows :—

Amount paid over to the city fund account	£50,000 0 0
Placed to carburetted water-gas plant acct.	7,015 1 10
Balance placed to contingent fund account	7,891 8 7
	£64,906 10 5

The appendices following the accounts furnish, as usual, statistics as to the progress of the gas undertaking during the year.

Appendix A is a comparative statement of the gas transmitted from the works in the daytime and during the twenty-four hours, for the past two years. Summarized, the figures are as follows :—

	Daytime. Cubic Feet.	Twenty-four Hours. Cubic Feet.
Year ended March 31, 1902	1,435,034,000	4 870,494,000
Do. do. 1901	1,367,193,000	4,733,825,000
Increase	67,841,000	136,669,000

Loss (by condensation and leakage), 155,814,000, or 3·2 per cent.

In Appendix B, particulars are given as to the results of the working from March 31, 1881, to March 31, 1902. The table contains statistics as to the number of tons of coal carbonized, the total make of gas, the percentage unaccounted for, the yield per ton of coal, the illuminating power of the gas, the quantity of residual products, &c., for each year in the above-mentionod period. The particulars for the past financial year are as follows: Coal and cannel carbonized, 456,727 tons; gas made, 4,869,976 cubic feet; yield per ton of coal carbonized, 10,663 cubic feet; illuminating power, 18·54 candles; make reduced to 20-candle power, 4,514,467 cubic feet; make per ton, 20-candle power, 9884 cubic feet; make of coke, 241,815 tons; do. per ton of coal, 12·63 cwt.; make of tar, 26,468 tons; do. per ton of coal, 12·13 gallons; make of ammoniacal liquor (10-oz. strength), 11,356,901 gallons; do. per ton of coal, 29·66 gallons.

Appendix C shows the number of stoves on hire and of each size of meter in use during the year in the city and out-townships. At the close of the past financial year, there were 8295 stoves on hire within, and 4635 beyond the city—together, 12,930, compared with 7804 and 4281 (together 12,085) at the corresponding date in 1901; so that there was an increase of 845. The number of meters in use was 136,920 in 1902 and 133,089 in 1901. There was last year a net increase of 3831 on the number for the preceding year. Of the total number at work on March 31 last, 131,897 were on hire, as compared with 127,496 at the close of the financial year 1900-1. The number of prepayment meters on hire on March 31 last was 38,495—an increase of 2677 on the number at the close of the preceding year.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 395.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	19—20	..	5 5 0
100,000	10	"	7½	Do. 7 p.c.	13—14	..	5 7 2
300,000	100	July 1	5	Australian 5 p.c. Deb.	100—102	..	4 18 0
200,000	5	May 14	6¾	Bombay, Ltd.	6—6¼	..	5 0 0
40,000	5	"	6¾	Do. New, £4 paid	4¾—4¾	..	5 9 5
380,000	Stk.	Feb. 13	12	Brentford Consolidated	255—260	..	4 12 4
270,000	"	"	9	Do. New	189—194	..	4 12 9
50,000	"	"	5	Do. 5 p.c. Pref.	128—133	..	3 15 2
206,250	"	June 12	4	Do. 4 p.c. Deb.	111—114	..	3 10 2
220,000	Stk.	Mar. 13	10	Brighton & Hove Orig.	205—210	..	4 15 3
246,320	"	"	7	Do. A. Ord. Stk.	148—153	..	4 11 6
460,000	20	Apl. 11	10	British	39—41	..	4 17 7
50,000	10	Feb. 13	12	Bromley, Ord. 10 p.c.	23—25	..	4 16 0
82,850	10	"	9	Do. 7 p.c.	18—20	..	4 10 0
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10—11	..	6 7 3
250,000	Stk.	June 24	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
150,000	20	July 11	8¼	Cagliari, Ltd.	21—23	..	7 3 6
100,000	10	June 12	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	54—56	..	5 7 2
550,000	Stk.	Apl. 11	12½†	Commercial Old Stock	265—270	..	4 12 7
251,875	"	"	5½†	Do. New do.	205—210	..	4 10 6
271,875	"	June 12	4½	Do. 4½ p.c. Deb.	130—134	..	3 7 2
800,000	Stk.	May 28	9	Continental Union, Ltd.	138—143	..	6 5 10
200,000	"	"	7	Do. 7 p.c. Pref.	147—152	..	4 12 1
575,000	Stk.	Feb. 27	7½†	Crystal Palace Ord. 5 p.c.	120—125	..	4 5 3
60,000	"	"	5	Do. 5 p.c. Pref.	122—127	..	3 18 9
106,158	"	July 11	5	Do. 5 p.c. Deb. Stk.	139—142	..	3 10 5
486,090	10	July 30	10½	European, Ltd.	18—19*	..	5 10 6
354,060	10	"	10½	Do. £7 10s. paid	13½—14½*	..	5 8 8
15,243,200	Stk.	Feb. 13	4†	Gas-light and Coke	4 p.c. Ord.	91—93	..	4 6 0
2,600,000	"	"	3½		3½ p.c. max.	90—92	..	3 16 1
3,799,735	"	"	4		4 p.c. Con. Pref.	111—113	..	3 10 10
4,193,975	"	June 12	3		3 p.c. Con. Deb.	93—95	..	3 3 2
70,000	10	Nov. 13	8	Hongkong & China, Ltd.	13—14	..	5 14 4
3,800,000	Stk.	May 14	10	Imperial Continental	204—207	..	4 16 7
473,600	Stk.	Feb. 13	3½	Do. 3½ p.c. Deb. Red.	100—102	..	3 8 8
561,000	Stk.	Feb. 27	10	Liverpool United A	220—222	..	4 10 1
718,100	"	"	7	Do. do. B	165—167	..	4 3 10
306,083	"	June 24	4	Do. do. Deb. Stk.	116—118	..	3 7 10
75,000	5	June 12	5	Malta & Medn., Ltd.	4¼—4¾	..	5 5 3
560,000	100	Apl. 1	5	Met. of Melbourne	5 p.c. Deb.	100—110	..	4 10 11
250,000	100	"	4½		4½ p.c. Deb.	103—105	..	4 5 9
541,920	20	June 12	5½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Feb. 21	4½	Newc'tle & G'tesh'd Con.	104—107	..	4 1 9
346,855	Stk.	July 4	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
150,000	5	May 28	8	Oriental, Ltd.	7—7¼	..	5 6 8
135,000	4½	"	8	Do.	6—6½	..	5 10 9
15,000	1	"	8	Do.	1¼—1½	..	4 11 5

* Ex div.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
60,000	5	Mar. 13	7	Ottoman, Ltd.	6¼—6⅝	..	5 3 8
851,070	10	Apl. 25	7	River Plate Ord.	10—10¼	..	6 13 4
303,000	Stk.	June 24	4	Do. 4 p.c. Deb.	93—96	..	4 3 4
250,000	10	Mar. 26	8	San Paulo, Ltd.	12—13	..	6 3 1
135,000	Stk.	Mar. 13	10	Sheffield A	239—241	..	4 3 0
209,984	"	"	10	Do. B	238—240	..	4 3 4
523,498	"	"	10	Do. C	237—239	..	4 3 8
6,000,000	Stk.	Feb. 13	5½†	South Met., 4 p.c. Ord.	124—127	..	4 3 11
1,700,000	"	July 11	3	Do. 3 p.c. Deb.	92—94	..	3 3 10
380,940	Stk.	May 14	5	Southampton Ord.	102—106	..	4 14 4
87,950	"	July 11	4	Do. 4 p.c. Deb.	100—103	..	3 17 8
120,000	Stk.	Feb. 27	6†	Tottenham and Edmonton	A. 5 p.c.	120—125	..	4 16 0
300,520	"	"	4¼†		B. 3½ p.c.	95—100	..	4 10 0
182,380	10	Jan. 16	5	Tuscan, Ltd.	7—8	..	6 5 0
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	95—98	..	5 2 0
230,000	5	Mar. 13	5½	West Ham, 10 p.c.	10—11	..	4 6 4
172,000	10	"	6½	Do. 7 p.c.	13—14	..	4 12 10
				WATER COMPANIES.			
780,599	Stk.	June 24	11½	Chelsea, Ord.	300—310	..	3 14 2
150,000	"	"	5	Do. 5 p.c. Pref.	152—157	..	3 3 8
160,000	"	"	4½	Do. 4½ p.c. Pref. '75	140—143	..	3 2 11
175,785	"	Mar. 26	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
1,720,560	Stk.	Mar. 26	8	East London, Ord.	215—220	..	3 12 9
654,740	"	June 12	4½	Do. 4½ p.c. Deb.	142—147	..	3 1 3
1,018,046	"	"	3	Do. 3 p.c. Deb.	96—98	..	3 1 3
700,000	50		8	Grand Junction	10 p.c. max.	112—117	..	3 8 5
310,000	Stk.	Mar. 26	4		4 p.c. Deb.	127—130	..	3 1 7
708,000	Stk.	Feb. 13	16	Kent	290—300	..	5 6 8
160,000	"	"	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	June 24	11	Lambeth, 10 p.c. max.	295—305	..	3 12 2
406,200	100	"	8½	Do. 7½ p.c. max.	210—220	..	3 17 3
350,000	Stk.	Mar. 26	4	Do. 4 p.c. Deb.	125—130	..	3 1 7
500,000	100	Feb. 13	12,5/10	New River, New Shares	400—410	..	3 2 5
1,000,000	Stk.	July 30	4	Do. 4 p.c. Deb.	125—130*	..	3 1 7
902,300	Stk.	June 12	7	Southwark and Vauxhall	Ord.	190—195	..	3 11 10
126,500	100	"	7		7½ p.c. max.	180—185	..	3 15 8
489,200	Stk.	"	5		5 p.c. Pref.	152—157	..	3 3 8
1,019,585	"	Apl. 11	4		4 p.c. A Deb.	125—130	..	3 1 7
1,155,066	Stk.	June 12	10	West Middlesex	275—285	..	3 10 2
200,000	100	"	4½	Do. 4½ p.c. Deb.	139—144	..	3 2 6
200,000	"	Mar. 13	3	Do. 3 p.c. Deb.	96—98	..	3 1 3

* Ex div.

† Next dividend will be at this rate.

From Appendix D, we learn that the gas-mains laid last year within the city extended to 15,952 yards, and beyond the city to 11,865 yards —a total of 27,817 yards, or 15¾ miles 97 yards. The mains taken up were 6451 and 3139 yards respectively—a total of 9590 yards, or 5¼ miles 350 yards. The total net increase during the year, therefore, was 18,227 yards, or 10¼ miles 187 yards. The total length of mains laid up to March was 1,449,127 yards, or 823¼ miles 207 yards.

Appendix E consists of a statement showing the amount of gross profit made from the gas undertaking, and the mode of its appropriation, also the amount of borrowed money owing, excess of assets, &c., from 1870 to March 31 last. The figures for the past financial year are as follows: Profit, £154,109; paid over for improvement purposes, £50,000; applied in extension of works, £7015, borrowed money owing, £1,179,974; and excess of assets, £1,225,182. The profit of £154,109 is appropriated thus: Interest, £44,075; liquidation of mortgage debt, £45,128—leaving a surplus of £64,906. From June 24, 1843, the date when the works were taken over by the Corporation from the Commissioners of Police, the gross profits on the gas undertaking have amounted to £4,885,832, out of which £1,142,925 has been paid for interest, and £1,099 741 placed to the sinking fund; leaving the net profit £2,643,166. Of this total, £2,180,100 has been handed over to the Improvement Committee and added to the city fund, £329,201 has been paid for street lighting (making £2,509,301 used in relief of the rates), and £82,696 applied in the extension of works for which no borrowing powers have been granted. The bulk of the last item (£79,125) has been expended on the installation of carburetted water-gas plant.

The report and accounts were presented at the monthly meeting of the City Council last Wednesday. In submitting them, the Chairman of the Gas Committee (Alderman Gibson) remarked that he had no special observations to make, except to point out the advance that had been made in the way of economical working. While 3000 tons of coal less had been carbonized than in the previous year, they had produced 136 million cubic feet more gas—in other words, they had been able to secure 400 cubic feet more gas out of every ton of coal, and the money value of the saving amounted to something over £18,000. For this result due credit must be given to their Chief Engineer (Mr. J. G. Newbigging) and to the Managers of the various stations, who had loyally and cheerfully carried out his instructions. Of course, this saving was one they could not expect to secure every year. The revenue had been much in excess of what it had ever been in any previous twelve months. It amounted to £763,210, or £40,000 more than in the immediately preceding year. It was both gratifying and surprising to find such an increase, considering the severe competition the gas undertaking had now to meet. The net profit, after paying the interest and sinking fund, was £64,000, though they had only estimated £50,000. The Committee had the audacity and temerity to prognosticate that the next report would show £80,000 profit; and he trusted they would be justified by the event. In that case, he hoped that at the end of the year—that was to say, in March; 1903—they would be able to make a very substantial reduction in the price of gas to consumers all round. The report and accounts were adopted.

The ordinary minutes of the Gas Committee contained several items relating to the settlement of contracts, including the following: The Workington Engineering and Wagon Company, for two steel tar-tanks, for the Bradford Road Station; West's Gas Improvement Company, Limited, for the supply and fixing of conveyor troughs and chains, with all appendages complete, at the Gaythorn Station; and Messrs. J. & J. Braddock, for clock, gauges, connections, &c., for meter-testing apparatus.

PUBLIC LIGHTING OF GLASGOW.

The Glasgow Corporation had before them at their meeting on Monday last week a report by Mr. Bruce Murray, a member of the Watching and Lighting Committee on the public lighting of the city. He began by referring to the fact that the darkness of Glasgow, especially in the side streets, was the subject of much unfavourable comment by visitors to the city during the Exhibition last year; and that one of the engineers attending the conference had characterized it as deplorable. He then proceeded as follows.

Notwithstanding the great advances that have been made in cities in England, and more especially those abroad, Glasgow has hitherto been content with a few experiments in some main streets, using, as far as gas is concerned, old and out-of-date lanterns, quite unsuitable for the modern systems of lighting. Lately some improvement has been made in the latter respect; and new, and, I believe, efficient, lanterns are being manufactured and introduced. But, though this is a move in the right direction, the rate of progress is very slow. The Watching and Lighting Committee have always dealt with complaints promptly, so far as their restricted conditions, financially and otherwise, admitted; but they have been hampered by the want of a definite policy as regards a system of lighting. This want is also a cause of embarrassment to both the Gas and Electricity Committees, and has led, I believe, to a certain amount of comparatively useless expenditure of capital. The Electricity Department has laid down mains for street lighting which are not yet utilized, and which, in view of the experience of other towns in incandescent and other systems of lighting, may never be utilized for this purpose; and the Department has made, or is making, provision for further extension.

Money has also been spent in the introduction of incandescent lighting under conditions that, to say the least of it, do not ensure the best results. The globe lamps employed generally are quite unsuitable. This form of lamp does not diffuse the light properly; and the

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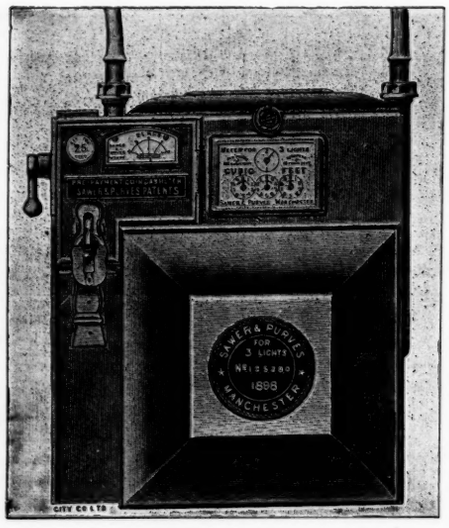

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method by which each lamp is fitted to the column is injurious to the life of the mantle, owing to the vibration of the pillars, caused by wind and heavy traffic. The thickness of the glass in the globular lanterns also lessens the light; while the hole at the bottom exposes the mantle to injury by wind. The reports from other cities show that any attempt to use incandescent gas otherwise than in the most approved form of specially-constructed lantern is doomed to failure. The quality of gas in Glasgow compares favourably with that in other cities, and, when properly utilized, the pressure is sufficient to produce the best results with incandescent mantles. But at present the natural pressure of the gas is not utilized, but, with a view to economy, is reduced by governors fitted to each lamp; and the quantity of gas used in side streets in ordinary lamps in Glasgow is less—in some cases to the extent of one-half—than the amount of gas that is allowed in other cities. The burners require at least 3 cubic feet of gas per hour for the proper use of the mantles, but are restricted, by false economy, to (say) 2 to 2½ feet.

In addition to having lanterns and mantles of the very best quality and design, special care and skilled attention are requisite to obtain the best results; and this important fact has not yet been sufficiently recognized in Glasgow. From private information, there appears to be little doubt that Berlin is the best lighted city in Europe; and, though there is a certain amount of electric light in use, that city is mainly illuminated by incandescent gas-lamps. Paris is also a splendidly lit city; and the Rue de la Paix is admitted to be the best-lighted street in Europe. The illumination of this street is effected by incandescent gas, which, notwithstanding the high price of gas—6s. 9d. per 1000 cubic feet—I understand works out at much less than the cost of electric light; and I am informed on good authority that the Municipality of Paris have decided not to extend further the system of electric lighting. The lighting of Vienna and most other Continental towns is greatly in advance of anything we can pretend to in this country. But for the purpose of comparison we need not go so far afield. Directing our attention, in the first instance, to one of the nearest neighbouring cities of similar size to our own—viz., Liverpool—which I know, from personal observation, is much better lit than our own city, I find that about five or six years ago the whole question of the lighting of the city was taken in hand by a Committee like our own, and, after careful inquiry and numerous experiments, it was finally decided in 1898 to rearrange the whole system of lighting, and apply incandescent gas to all the streets, the change to be carried out in four years. The conversion, however, was practically effected in three years, with the result that the illuminating power of lamps throughout the city was increased before midnight from 466 million candles to 1576 million candles, or nearly four times; while after midnight the illuminating power was increased from 304 to 685 million candles, or more than double. It is important to note that, notwithstanding this great increase in illuminating power, the total cost for lighting, which was £40,889 in 1893, amounted in 1901 to £39,587, or a reduction of £1302. There were special circumstances connected with Liverpool, such as the reduction of 10 per cent. in the charge for gas for street lighting, which the Gas Company were compelled to give under arbitration, and some other minor matters; but the result clearly shows that the lighting of a city can be greatly increased by means of incandescent gas, with practically little or no additional cost.

Mr. Murray referred to incandescent lighting in Newcastle, Cardiff, &c., and then went on to say: I think one of the first duties of the Committee should be to inquire most particularly into the relative cost of electricity and incandescent gas. The adoption of electric lighting, from such information as I can obtain, has already added considerably to the cost of lighting the city; and in this connection I would refer to the recent resolution, approved by the Corporation, to fit 228 additional electric lamps. The annual charge for electricity, at £14 for each lamp, amounts to £3192, with, I understand, a capital expenditure of £7200. Taking 6 per cent. to cover interest and depreciation, this adds £430 per annum to the cost, making £3622. The number of ordinary gas-lamps that will be displaced is 589, and the cost of lighting at present only amounts to between £1200 and £1300. So that the Watching and Lighting Committee have recommended an increased expenditure of about £2400 on the area covered by these 228 electric lamps. Our Inspector of Lighting estimates that the value of incandescent against flat-flame burners may be taken as four times greater in favour of incandescent. From this, it would appear that, with the same consumption of gas, greatly increased illumination could be obtained, with only the additional cost entailed by the capital expenditure on fitting, upkeep, mantles, &c. What I think is a very liberal estimate for supplying incandescent gas on the most improved system to the same district, including labour, &c., has been given to me by our Inspector of Lighting—viz., £2000. This appears a good deal higher than the other figures in statistics before us; but, accepting it as correct, it would show that, allowing for interest on a capital expenditure of £2000 for new lanterns, &c., the annual charge for incandescent gas would be £2120, as against the cost of electric light, £3622—a difference of £1500 on this one district alone. At a meeting of the Sub-Committee on Public Lighting, held on the 7th of May, the following resolution was agreed to: Before recommending any definite system, it be remitted to the Inspector of Lighting, the Gas Engineer, and the Electrical Engineer, to have two streets in the city fitted up with the most approved systems of incandescent gas and the Nernst electric incandescent light system respectively, and that the Corporation recommend the Gas and Electricity Committee to authorize the officials of these departments to carry out the necessary experiments, and, with a view to this Sub-Committee making a comparison of the respective systems, they be authorized to visit, if necessary, other towns, for the purpose of inspecting and reporting on the lighting of the public streets thereof."

Mr. PRIMROSE, in moving the adoption of the minutes of the Committee and of the above report, said the latter had received the unanimous approval of the Committee with the exception of one member, who dissented on a minor point. Having paid a tribute to the very

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valuable labour of Mr. Bruce Murray, he expressed the hope that the minutes and report would meet with the approval of the Corporation, and that the Committee would be empowered to deal with the very momentous question in a complete and adequate manner.

Mr. CLELAND seconded the motion.

Bailie WILLOCK said he could not approve of the proposal to send a deputation to visit, if necessary, other towns. He moved as an amendment, that the latter part of the minutes, empowering a deputation be deleted. He was prepared to approve of experiments being made.

Mr. GIBSON seconded the amendment.

Mr. W. F. ANDERSON moved that the report should stand over for consideration for a fortnight.

Bailie MACLAY seconded Mr. Anderson's amendment.

The LORD PROVOST said it seemed to him that as the report was dated so far back as May, and only submitted now, there would be no very special necessity for pressing it that day.

Mr. BRUCE MURRAY said he would like to point out that one reason why the report had been held over so long was that no experiments could be made during the summer. Besides, the approval of the report did not commit anyone. The Committee were merely letting the Council know what had been done. They had reached a stage in their work, had made full inquiry, and had obtained abundant information more or less authentic. But before they could go further, it would be satisfactory that some member of the Corporation should go to Liverpool to see how that city was lighted.

Mr. PRIMROSE pointed out to those who advocated delay that all the Committae asked was that, before recommending any definite system, they should accumulate some information and report. They wished to obtain the very best exposition of incandescent gas lighting and the best electric lighting, and they proposed to equip a street with each installation for the Council's observation. His Committee very earnestly desired to do the work thoroughly and efficiently, and he would give his personal guarantee that every restraint would be exercised with regard to expenditure.

On a division, the minutes were passed by 32 votes to 12.

ELECTRIC LIGHTING NOTES.

Electric Lighting at Kendal.

The electric light supply for the borough of Kendal was formally inaugurated last Wednesday evening. The engines were set in motion and the current was switched on by Mrs. Gilkes, the Mayoress. Alderman Monkhouse, Chairman of the Electricity Committee, stated that the cost of the buildings and installation was about £12,000, and that notwithstanding the previous existence of private installations in the borough 2500 lamps were already connected with the works. The demand for the light was already nearly equal to their producing power.

Gas Displaced in Redruth Streets.

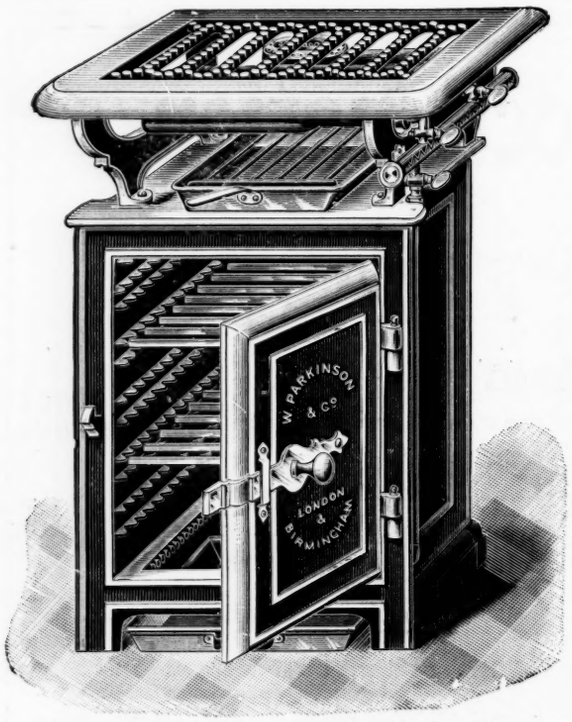
The principal streets of Redruth were lit by electric lamps for the first time last Friday week. The laying of cables and the fixing of standards and globes during the week was a very smart piece of work. It was understood that the Urban District Council, who had already extended the time by one month from the 1st. ult., would not grant any further extension, but would insist on the fine of £40 per night being enforced unless light should be provided in the chief thoroughfares. The contractors had thus to make a special effort. It was at Redruth, it will be remembered, that William Murdoch first applied coal gas to lighting purposes. He used it in his house in Cross Street in 1792. Now, in 1902, in connection with the coronation, it is suggested that a fitting memorial should be erected at Redruth to perpetuate the memory of Murdoch's work, and more than a century of gas lighting.

The Past Year's Work in Manchester.

At the meeting of the Manchester City Council last Wednesday, the annual report of the Electricity Committee was presented. It showed that the total number of consumers on March 31, was 4030, or an increase of 260 on the previous year. The number of lamps connected was as follows: Incandescent (of 8-candle power) 307,067, arc 2453, compared with 279,860 and 2316 respectively. In addition to these, 774 motors were in use, representing 2806-horse power; being an increase on the preceding year of 102 motors, equivalent to 32-horse power. The maximum demand on the works at any one time during the year was: For lighting and power, 7,930,000 watts; for traction, 1,210,000 watts—a total of 9,140,000 watts. The total output of electricity from the works during the past twelve months amounted to 12,697,590 units. The quantity measured and accounted for was 11,518,940 units—showing a difference of 1,178,650 units; being the quantity used in distribution or otherwise not accounted for, equal to 9·28 per cent. The total length of mains laid at the close of the financial year was 209 miles 1299 yards; being an increase of 50 miles 814 yards on the previous year. The revenue derived from sales of current (which works out at 3·07d. per unit sold) amounted to £134,462, and the working expenditure to £74,054, showing a gross profit of £60,407. Of this sum, £52,773 is set apart for interest on mortgage debt, &c., sinking fund, and the instalment of loan repaid; leaving a surplus of net profit of £7634 to be carried to the reserve fund. The total borrowing powers now amount to £2,171,121.

A Bid for the Public Lighting of Newton Abbot.

The Urban District Council of Newton Abbot have before them proposals made by a local Electric Light Company to undertake the public lighting; and as the Engineer and Manager of the Gas Company (Mr. J. G. Clark) is not the kind of man to allow himself to be ousted without a word in defence of the existing system of lighting, he has addressed to a local paper a long letter containing an array of figures which should make the Council pause before they abandon the certain for the uncertain. The Electric Light Company propose to



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light the chief streets of the town by arc, and the rest by incandescent lamps; the former being turned off at eleven o'clock. The total lighting power of the two kinds of electric lamps is put down at 21,500 candles for 1500 hours, and 3000 candles per hour for a like number; making altogether 36,750,000 candles. The present gas-lamps burn at the rate of 16,949 candles per hour for 1624 hours, and at the rate of 15,373 candles per hour for 1543 hours. The total illuminating power is 51,245,715 candles, or 14,495,715 candles in excess of the proposed electric light. The Electric Light Company offer 15 arc lamps, giving a total light of 15,000 candles at a cost of £240 per annum; but Mr. Clark shows that they can have a more equally distributed light of this power from intensified gas for £177, which is £63 per annum cheaper than the electric arcs. Another offer of the Company is 50-candle glow lamps at £4 10s. each per annum. This is at the rate of 1s. 9½d. per candle per annum. The Council now pay £2 18s. 6d. each per annum for 100-candle incandescent gas lights, which is at the rate of 7d. per candle, and is 1s. 2½d. per candle per annum cheaper than the electric incandescents, while the light is twice as great. Then, 25-candle glow lamps are offered at £3 each, or at the rate of 2s. 4¾d. per candle per annum; but the Council can get from incandescent gas 75-candle power, which is three times more light, at a cost of £2 7s. 6d. each lamp, or at the rate of nearly 7¾d. per candle per annum, and therefore 1s. 9d. per candle cheaper than the electric glow lamps. The 25-candle half-night electric incandescent lamps are offered at £1 15s. each per annum, or at the rate of 1s. 4¾d. per candle. The Council can have 75-candle half-night incandescent gas lights, which give three times more light, at £1 10s. 4d. each lamp per annum, or at the rate of 4¾d. per candle per annum, and 1s. per candle cheaper than the electric glow lamps. It will thus be seen that the Electric Light Company's proposed charges are considerably more than the Council now pay per candle for gas. There are at present in the town many lamps in which the ordinary flat-flame burners still exist. If incandescent gas lights were substituted for these, the town would get the light of 27,575 candles per hour. Mr. Clark has thus made out an excellent case for gas; and the District Council would do well to carefully consider it.

Reductions in Price.—On the recommendation of the Gas Committee, the Bolton Town Council have agreed to reduce the price of gas by 2d. per 1000 cubic feet, and have declined to make any differential charges for cooking, heating, and motive power. The report of the Walton-on-Thames and Weybridge Gas Company for the half year to June 30 announces that the price of gas has been reduced by 2d. per 1000 cubic feet as from Lady Day. The Willenhall Gas Company have announced their intention of reducing the price of gas to ordinary consumers by 2d. per 1000 cubic feet as from September 30 next. At the meeting of the Ulverston District Council last Wednesday, the price of gas was reduced from 3s. 2d. to 2s. 11d. per 1000 cubic feet—to take effect from the 1st of October.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

It is evident that the Town Council of Dundee look upon the duty of filling up the vacancy in the gas managership as a matter which can be taken quite leisurely. At a meeting of the Corporation on Thursday, it was reported that the Gas Committee had that day had the subject before them; that there were 35 applications for the post; and that the Town Clerk had been instructed by the Committee to prepare a vidimus of the whole list. What is a vidimus of a list of applications? Is it that the Town Clerk is, to save the members of the Corporation the trouble of wading through the testimonials which have been lodged along with the applications, to schedule the qualifications, if that were possible? It is not possible to schedule qualifications, and therefore the personal element will—notwithstanding it may be unconsciously—appear on the face of the vidimus. Better, I should say, let the Committee make a selection, and leave the Town Council to approve or not of the names so brought forward.

What looks like an excellent endeavour to improve the public lighting of Glasgow has been begun by the Town Council of the city. To be more accurate, the beginning of the movement is not altogether recent, but is a sort of evolution in the minds of certain leading councillors, which took shape after the lighting of last year's Exhibition was seen, and particularly after the Engineering Congress which was held in the early days of September. It has taken concrete form in the hands of Councillor Bruce Murray, who has prepared an elaborate report on the subject, and submitted it to a Sub-Committee on Public Lighting. The report points out the poverty of the public lighting of Glasgow, in which, I may say, the city is not singular, as there is not a well-lighted town of any size in Scotland. This is due, probably, in some measure, to the reliance which has been placed upon the higher illuminating power of Scotch gas; but I have little doubt that it is also, in large measure, the outcome of the fact that Scotch communities are, as a rule, well behaved, and the police authorities have not felt it necessary to call for more light. I imagine that what has brought the subject forward at this time is the comparison, which cannot fail to be made by everyone, of the lighting effects produced by the £14 a year electric arc lamp and the 35s. a year gas-lamp. On this subject most people unthinkingly jump to the conclusion that electricity is the superior light. Mr. Murray, as all other investigators into the subject have done, comes to the conclusion that gas is the better illuminant—certainly very much the cheaper one, which is one of the prime elements in the decision as to which system to adopt. He points out that the Watching and Lighting Committee have recommended the fitting up of 228 additional electric lamps. Mr. Murray finds that the annual cost of these lamps, including interest on capital and depreciation, will amount to £3622. The 228 lamps will replace 589 ordinary gas-lamps, the annual cost of which is between £1200 and £1300; so that, he shows, the Watching and Lighting Committee,

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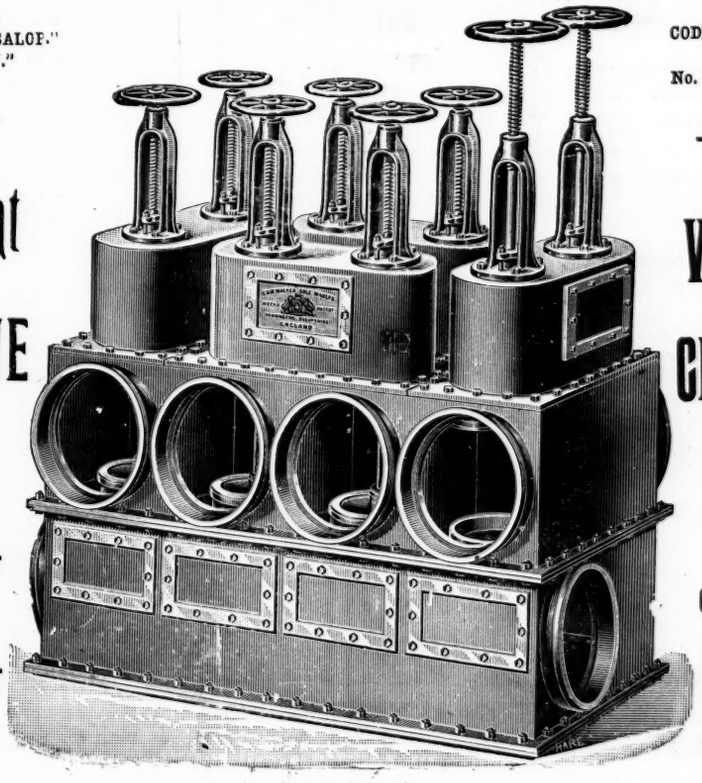

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in their recommendation, propose to incur an increased annual expenditure of £2400 in the area to be dealt with. The Public Lighting Sub-Committee, at their meeting on the 7th of May, resolved to recommend that, before suggesting any definite system of lighting, it should be remitted to the Inspector of Lighting, the Gas Engineer, and the Electrical Engineer, to have two streets in the city fitted up—one with the most approved system of incandescent gas lighting, and the other with the Nernst incandescent electric lighting system—with a view to experimenting, so as to enable a comparison to be made, and that power be given to visit other towns to see the systems of lighting in use. This recommendation was founded on the conclusion that Mr. Murray arrived at, that the lighting of the city had suffered from the want of any definite system—it being freely admitted that experiments have been made, and new methods adopted, though not on a general or an exhaustive scale; and reference was made to the experience of the Corporation of Liverpool, who, by the adoption of a general system of lighting by incandescent gas, have increased the illuminating power from 466 to 1576 million candles, and, while doing so, have effected a reduction of £1302 a year in the cost of lighting—from £40,889 to £39,587. The recommendation came before the Corporation on Monday last. The only opposition offered was to the proposal to give power to visit other cities. This, it was thought, might be taken to mean a trip to the Continent or America. But an assurance was given that the utmost restraint would be exercised in the matter of visits to other towns; and the Council, by 39 votes to 12, approved of the recommendations of the Sub-Committee.

It is reported that the accounts of the Greenock Corporation gas undertaking for the past year have closed with a surplus of about £3700, but that, as fully half of this sum must be credited to the previous year's account, the actual surplus for the past year will be about £1500; and also that the accounts of the Corporation Electricity Department show a deficit of about £1500.

I mentioned three weeks ago that the report of Mr. J. Kincaid, the Engineer and Manager of the Falkirk Corporation gas undertaking, was submitted at a meeting of the Town Council, and that it was ordered to be printed. The report states that the quantity of gas manufactured was 130,774,220 cubic feet, an increase over the previous year's make of 7,416,700 cubic feet, or equal to 6·01 per cent. The quantity of gas accounted for was 114,987,500 cubic feet, an increased consumption over that of the previous year of 8,140,400 cubic feet, or equal to 7·62 per cent. The higher percentage of gas sold was due to unaccounted-for gas being reduced to 12·07 per cent., which was 1·31 per cent. less than in the previous year. During the year, 14,137 tons of coal were carbonized, which yielded, on an average, 9250 cubic feet of gas per ton, as compared with 9478 cubic feet in the preceding year. The lower yield of gas was due to an additional 15 per cent. of local splint coal having been used. This class of coal cost less than cannel or shale, and the mixture had enabled them to manufacture gas at a reduction of 0·9d. per 1000 cubic feet when compared with the classification of the previous year, taking the standard of prices at the same rate for the two years. The coke and breeze sold amounted to 6122 tons, or 784 tons more than in the previous year—an increased yield of 0·46 cwt. per ton of coal carbonized. Deducting the quantity of shale used, from which no coke was obtained, 10 cwt. of coke were sold for every ton of coal carbonized, in addition to that which was used for heating retorts and raising steam. The tar and ammoniacal liquor sold amounted to 739,730 gallons, being at the rate of 52·32 gallons per ton of coal, or 0·23 gallon less than in the previous year. During the year, 537 tons of lime were used, as compared with 616 tons. The works continue in the same condition as a year ago, and were in as efficient a state as could be expected. All the retorts available were in use last winter; but there is now under consideration a proposal by which the capacity of the retort-house may be increased by 8 per cent. The mains were extended 1406 yards, 723 yards were enlarged or renewed, and 127 new service-pipes were laid and connected. The number of escapes in service-pipes was reduced from 105 to 40, indicating an improvement in their condition. The number of new or repaired meters fitted up during the year was 843. Consumers increased by 339. Of these, 224 were ordinary consumers, and 115 were consumers through prepayment meters. The total number of consumers on the 15th of May was 6351—4897 ordinary and 1454 prepayment meters.

The note I sent you last week as to the Coatbridge Gas Company was, it seems, both premature and misleading. It was a half-yearly report which was summarized, and the meeting which was said to have taken place was only held yesterday. From a fuller statement, I learn that the gas sold during the half year amounted to 55,570,525 cubic feet, and that the gas unaccounted for was 680,000 cubic feet, equal to 9·62 per cent., which is wonderfully low for Coatbridge, where there are so many underground workings. The coal carbonized amounted to 7762 tons, and the gas produced was equal to 8813 cubic feet per ton. The average cost of coal per ton (including benzol for enriching) was 9s. 2·04d., and the average illuminating power of the gas was 21·81 candles. There was a yield of green tar of 9·78 gallons, and of sulphate of ammonia of 31·76 lbs., per ton of coal. The return from residuals was: For tar and naphtha, £417, equal to 1s. 0·88d. per ton of coal; for sulphate of ammonia, £1062, equal to 2s. 8·84d. per ton of coal; for coke and char, £1581, equal to 4s. 0·88d. per ton of coal; and £40 was derived from cash sales, equal to 1·23d. per ton of coal. The total return from residuals was thus £3100, which is equal to 7s. 11·83d. per ton of coal, and reduces the net cost of coal to 1s. 3d. per ton—a wonderful achievement, which emphasizes what Mr. T. Wilson, the Manager, said at the Informal Meeting in Glasgow last April, that they got gas for nothing (taking into account the saving by using benzol). Coal, shale, and benzol cost £3559; and deducting the £3100 received for secondary products, the net cost of coal was £459, equal to 1·71d. per 1000 cubic feet of gas made, and 1·89d. per 1000 cubic feet of gas sold. Lime and oxide cost £8 10s. The total expenditure was £3650, equal to 1s. 1·57d. per 1000 cubic feet of gas manufactured, and 1s. 3·03d. per 1000 cubic feet of gas sold. The

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BLACKBURN	1,250,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000
PERNAMBUCO (Brazil)	125,000
MALTON	150,000
DULUTH, MINN. (Second Contract)	300,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 Cub. Ft. SMETHWICK, 500,000 Cub. Ft. LEICESTER (2nd Cont.), 1,000,000 Cub. Ft.
GRAVESEND, 300,000 C. Ft. BROCKVILLE (ONT.), 250,000 C. Ft. NEWPORT, MON. (2nd Cont.), 250,000 C. Ft.

shareholders yesterday approved of the report and recommendations of the Directors, the Chairman congratulating the members upon the satisfactory balance and upon their being able to pay the usual dividends, notwithstanding a reduction of 5d. in the price of gas. He also expressed the hope that they would soon be able to further reduce the price of gas.

The Corporation of Troon have reduced the price of gas from 5s. to 4s. 7d. per 1000 cubic feet for ordinary lighting, and from 4s. 6d. to 4s. 2d. for public lighting. The Corporation have expended large sums upon the gas-works since they acquired them, about two years ago; but, notwithstanding this, they have been able to give up the charge for meters, which was at the rate of 3s. per year, and to effect this reduction.

A singular state of matters has arisen at Broughty Ferry. Ex Bailie Watt, the Convener of the Gas Committee, at a meeting of the Town Council on Monday, explained that, owing to a clerical error in the estimates two years ago, the accounts closed last year with a deficit of nearly £1000. On that occasion they reduced the price of gas by 5d. per 1000 cubic feet. If they had allowed the price to remain unchanged, there would have been no debit balance; but their prospects were favourable, and they hoped to square matters during the year. Unfortunately, their anticipations had not been realized, and they were now face to face with a deficit of £1025. Various causes had led to this state of affairs. In the first place, their revenue from the sale of gas was £368 less than was anticipated. He attributed this to the stoppage of free connections for gas appliances. During the previous year, when they gave such facilities, no fewer than 402 gas-consuming appliances were applied for. During the eleven months of the past year, when free connections were withdrawn, the number of cookers and heaters applied for was only 158; while during the few months in which the Council had renewed the old conditions, over 100 appliances had been provided. Then the Council expected to dispose of their coke at an average of 8s. per ton; but it had realized a shilling less, and the total loss in this respect had been £250. The explanation was that the Dundee Corporation was a strong competitor; the coke produced there, owing to unfortunate circumstances connected with their works, being richer in quality than that at Broughty Ferry, with the result that the latter had to be reduced in price. The revenue from sulphate of ammonia was £90 less than was anticipated, which was due to the fact that the plant was not ready until about a fourth of the year's gas had been made. The extensions at the works had occasioned extra expenditure for the handling of coal to the amount of £165, and for coal storage to the amount of £170; and benzol cost them more than they expected. In framing the estimates for the current year, coal had been taken at the price already contracted for. They calculated that they would receive less for sulphate and for coke; but, on the other hand, their wages bill would be less, owing to the improvements in the retort-house. And they estimated that there would be an increase in the consumption of gas of about 1½ million cubic feet. It was very desirable that the deficit should be wiped off; and he hoped that this would be accomplished by raising the price of gas by 5d. per 1000 cubic feet. Next year, he hoped, they would be able to reduce the price of gas again. Mr. J. R. Christie, the Convener of the Gas Committee, said he differed from ex-Bailie Watt as to the quality of their coke. He thought it was the cost of carting it to Dundee which placed them at a disadvantage with the Dundee Corporation. The Council raised the price of gas to the former figure—2s. 11d. within, and 3s. 4d. without the burgh.

In presenting the accounts for the past year to the Town Council of Newport (Fife) on Monday, Bailie Thorn said that for the first time they had to deal with a gas account. They took over the Gas Company's property in September; and during the period under review, they started with a reduction of 5d. in the price of gas, and closed with a substantial credit balance of £592 19s. 2d.—a sufficient answer to the experts and other croakers who were so anxious to point out, in the burgh extension inquiry, that they would soon be on the highway to bankruptcy.

In his annual report to the Magistrates and Town Council of Edinburgh, the Firemaster reports that during the year the most disastrous fire occurred at the Stockbridge Flour Mills, on the 16th of July, 1901, and was caused by an explosion of gas. In addition to the destruction of the greater part of the mill, fourteen persons were severely injured, of whom six succumbed to their injuries. The accident, it will be remembered, was due to the carelessness of some of the men who were killed, in cutting a gas-pipe in the course of their work in the removal of a gas-engine. As to the causes of fires, the Firemaster reports thirteen as due to defective gas-fittings, six to electric light, one to a gas explosion, fifteen to goods coming in contact with gas-jets, six to lamp explosions, and seven to the upsetting of lamps. No fires were attributable to naked lights on gas-brackets.

Suffocation by Straight Water Gas.—Last Wednesday, the body of a man named Patrick McLoughlan was found near the gas-producers at the Brunswick works of the Patent Shaft and Axle-tree Company, Wednesbury. Deceased had been in the habit of sleeping out, and it is supposed that he went to sleep at the works and was suffocated by the water gas used there.

Proposed Conversion of Glasgow Gas Annuities.—We learn that the Finance Committee of the Glasgow Corporation have decided to recommend the conversion of the 9 per cent. and 6¾ per cent. gas annuities into 3 per cent. Corporation redeemable stock. The 9 per cent. annuities have a value of £300,000, and 6¾ per cent. annuities a face value of £115,000; the present market prices being respectively £285 10s. and £215 per £100. This brings the total present market value of the gas annuities to £1,103,750; yielding £3 3s. and £3 2s. 9d. per cent. respectively. In order to give the same interest at par, it is proposed to issue £300 in the one case and £225 in the other of 3 per cent. stock for every £100 of the annuities; giving an intermediate addition in capital value of £14 10s. to the holder of every £100 of 9 per cent., and £10 to the holders of 6¾ per cent. annuities.

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CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 9.

Sulphate of Ammonia.

There has been a fair demand; but it has not been sufficient to improve values at any point, the closing quotations being £11 17s. 6d. per ton f.o.b. Hull, and £12 per ton f.o.b. Liverpool and Leith. Consumers who have had August bought in advance are rather pressing for their deliveries; but they are not willing to pay prompt prices for further parcels for prompt delivery. The buying has consequently been mainly for covering August contracts. For delivery ahead, buyers' limits have further declined; but speculators, being unable to cover sales already made, seem less inclined to commit themselves than they were recently, so that, though there has been large inquiry, actual business has been limited.

Nitrate of Soda.

This is steady at 8s. 4½d. per cwt. for ordinary, and 8s. 7½d. for refined quality, on spot.

LONDON, *Aug.* 8.

Tar Products.

The markets continue very quiet, and there is an absence of business, doubtless owing to the holidays. In pitch, the demand for home consumption continues very strong, and there is now more inquiry from South Wales for delivery over the early part of next year. Crude carbolic is decidedly easier. Business has again been done in 60 per cent. at 1s. 8½d.; but consumers will not purchase except for early delivery. It is difficult to fix the actual value of crystals. Sales of 34-35 per cent. are reported at very low prices, and 39-40 per cent. is neglected. In creosote, several contracts have been made in the Yorkshire district, but Midland makers appear more anxious to sell. Stocks have increased in the provinces, and the demand is not brisk. Solvent and toluol remain unchanged. Prices are purely nominal, and there is no business doing in either article. As regards benzol, some small sales of 90 per cent. are reported at from 7½d. to 7¾d. at outports; but London makers still ask 8d. for prompt and 8¼d. up to the end of the year. The position of anthracene remains the same. There are inquiries for "A" quality, 45 per cent., all over next year, and in several instances consumers appear desirous of purchasing even higher percentages. "B" qualities are entirely neglected; and it will be impossible to place same in the future unless an entire change takes place in the position of the market.

The average values during the week were: Tar, 17s. 6d. to 22s. Pitch, London, 50s. to 52s. 6d.; east coast, 47s. 6d. to 48s. 6d.; west coast, 43s. to 43s. 6d. Benzol, 90 per cent., 7½d. to 8d.; 50-90 per cent., 7d. Toluol, 8d. Crude naphtha, 2½d.; solvent naphtha, 8d. to 9½d.; heavy naphtha, 9d. to 10d. Creosote, London, 1¼d.; North, 1d. Heavy oils, 1⅞d. Carbolic acid, 60 per cent., 1s. 8½d. Naphthalene, 35s. to 50s.; salts, 21s. to 22s. 6d. Anthracene, "A" quality, 1½d. to 1¾d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The markets are decidedly dull, and there is little or nothing to report. Beckton position remains unchanged, as consumers will not pay the price asked by the manufacturers. In Hull, a little business has been done at £11 17s. 6d. for prompt, but for October-March consumers offer only £11 5s. There is no business to report from Leith. Sellers ask £12 for prompt; but at this price consumers are not open to purchase, and there is little or no demand for forward delivery.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Work at the collieries generally continues very irregular, owing to holidays and wages disputes stoppage, and coalowners have very little surplus they are at all compelled to push for sale on the market. In one or two isolated cases where special conditions prevail, some of the inferior qualities of round coal are being offered at very low-cut figures; but these are quite exceptional. As a rule, prices for all descriptions of fuel are being well maintained, and the tendency is, if anything, to harden where buyers wish to place contracts for long forward delivery. In our recent review of the season's gas coal contracts, it was intimated that prices had probably touched their lowest level; and there are now reports that in some cases where gas coal buyers have been holding back from settling their contracts they have received intimations from collieries that quotations are now withdrawn. It is stated there are a fair number of gas companies who seemingly have been holding back in anticipation of being able to secure more favourable terms; but, judging from the strong tone that is being shown by colliery owners, it would appear doubtful whether gas coal contracts could now be placed except at some slight advance upon the minimum figures that were being quoted a month or so back. There is, however, no actually quoted alteration in the current basis rates, except that they are hardening up to maximum quotations. Good qualities of slack, suitable for gas-making purposes, can scarcely be quoted under 7s. 9d. to 8s. per ton at the pit, good gas nuts from about 8s. 6d. upwards, screened Wigan four-feet from 9s. to 9s. 6d., and best screened Arley 10s. up to 10s. 6d. For ordinary steam and forge coal, prices for immediate sales are not altogether strong, owing to collieries here and there having surplus which they have to clear away promptly; but where prices are being cut the lowest is chiefly for shipping orders. On inland sales, ordinary descriptions of steam coal only in exceptional cases are obtainable under 8s. 6d. to 9s. at the pit; but for shipment as low as 9s. 3d. to 9s. 6d would be taken for delivery at the Mersey ports, with better sorts quoted at 10s. up to 10s. 6d. per ton. House-fire descriptions are in very fair demand for the time of the year; and with

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Dealers in Benzol, Carburine, and all other Naphthas and Oils suitable for the Enrichment or Production of Gas.
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little or no pressure of surplus output on the market—collieries requiring any excess of production for stocking purposes—prices for the most part are being firmly held to at about the list basis rates, averaging from 13s. 6d. to 14s. per ton at the pit for best Wigan Arley, 12s. to 12s. 6d. for Pemberton four-feet and seconds Arley, and 9s. 6d. to 10s. for common house coal. Engine classes of fuel continue generally in active request, particularly the better sorts, supplies of which are becoming scarce to meet requirements. This is rather an exceptional condition for this time of the year, when the holidays in the manufacturing centres cause considerable temporary restriction of requirements, while the unsatisfactory condition of the cotton trade has also a tendency to lessen the demand for engine fuel. The present position is no doubt brought about by the very irregular working of the collieries for some time past. At any rate, good qualities of slack are now undoubtedly hardening, and are not being quoted under 6s. 6d. to 7s., with special sorts from 7s. 6d. to 8s. at the pit; and it is exceptional where less than 5s. would be taken for ordinary common Lancashire slack. Both foundry and furnace qualities of coke meet with a demand in excess of what makers are producing, and although no actual quoted advance in list rates has taken place, there is a hardening where new business is offered.

Northern Coal Trade.

There has been a more active demand for coal; and the production having been curtailed by the holidays, prices of some kinds have been firmer in consequence. In the steam coal trade, the exports are now at about the highest point, and the price of best Northumbrian kinds is steady at about 11s. 6d. per ton f.o.b. Second-class steams are from 10s. to 10s. 9d. per ton f.o.b., and steam smalls 5s. to 5s. 6d. The collieries are now working fairly well, and the supply of fuel is increasing. In Durham coal, the demand is now beginning to be enlarged, but is still only moderate. In gas coals, the best qualities are in good request, and as the contracts take up so much of the output, high prices are asked for the remainder for sale—10s. per ton being quoted for occasional cargoes. Generally, Durham gas coals may be put as from 9s. 3d. to 9s. 9d., with perhaps a slightly lower price for second classes. In coke, there is again a firmer tone all round. Gas coke is firmer, and on Tyneside it is rather scarcer for export; the production being very small at present. There is some irregularity in prices quoted; but about 11s. 6d. per ton f.o.b. may be the medium figure at present in Newcastle.

Scotch Coal Trade.

Trade remains unchanged, the volume of business being fairly good. There is plenty of inquiry for forward orders, but little business has, as yet, been done. The prices quoted are: Main 8s. 3d. to 8s. 6d. per ton f.o.b. Glasgow, ell 9s. 3d. to 9s. 9d., and splint 9s. to 9s. 6d. The shipments for the week were 220,063 tons—an increase of 80,487 tons upon the previous (holiday) week, but a decrease upon the corresponding period of last year of 7253 tons. For the year to date, the total shipments have been 5,966,008 tons—an increase of 383,484 tons upon the same period of last year.

The Costs of the Wolverhampton Water Bills.—The Water-Works Committee of the Wolverhampton Corporation, in the course of their annual report, state that the sum of £1287 13s. 7d., representing the balance of the costs of the Water Bill of 1901, has been debited to the account of income and expenditure. It is proposed to defray the expenses of the Bill of this year out of the reserve fund; and a first instalment of £1413 16s. 1d. appears under this head in the accounts accompanying the report. The profit for the year amounted to £2668.

Gas-Works Investigation Ordered at Stockton.—At last week's meeting of the Stockton Town Council, the following resolution was moved by Mr. Meggeson, and carried *nem. con.*: "That the Gas Committee be instructed to institute investigations into the alleged irregularities which have taken place at the gas-works, as brought to light by the evidence at the recent assize trial at Durham." The trial referred to was, of course, the action for libel brought by a councillor against a burgess of the town, who asserted that the plaintiff used his position as a member of the Gas Committee for his personal advantage—one of the charges being that he employed the Corporation workmen for his own purposes. It will have been seen from the short report of the case which appeared in the "JOURNAL" (*ante* p. 287), that the Jury returned a verdict for the plaintiff, and assessed the damages at £175.

Market Harborough Gas Supply.—At the last meeting of the Market Harborough District Council, the annual report of the Gas Engineer and Manager (Mr. A. T. Harris) was presented. It showed that there was during the year an increase of 2,102,700 cubic feet of gas in the sales to private customers. An additional quantity of gas used in the public lamps was due to the larger number in use, and also to many of the regulators passing a greater quantity of gas per hour than that upon which the basis of the previous year's consumption was founded. The benefits arising from the adoption of the regenerator retort settings were shown by the augmented yield of gas and the extra quantity of coke available for sale. The make of 10,950 cubic feet of gas per ton of coal carbonized was exceptional, however, and, being obtained while the whole of the retorts were in their best possible state, was not likely to be maintained when their average condition became normal with wear and tear. The sale of coke increased by 402 tons 10 cwt.; but the amount received was £119 2s. 11d. less than in the previous year, owing to a fall in the price. The statement of accounts showed the receipts to be £7913 5s. 11d., an increase of £223 2s. 2d.; and the expenditure, £5832 1s. 11d., or £376 10s. 8d. more. The gross profit was £2081 4s., compared with £2229 12s. 6d. The repayment of loans, interest, and other charges amounted to £2166 13s. 5d.

Messrs. Joseph Taylor and Co., of Bolton, have received orders for, and have in hand, solid plate lead saturators of their best and latest make, with double detachable ammonia pipes, detachable acid pipe, and lead lips, and stoutly braced with pitch pine laggings, for the Worcester Gas Company and the Hemel Hempsted Gas Company.

The best Brains,

The best Material,

The best Skill

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in making

The best Cooker,

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The report of the Leeds Fireclay Company for the twelve months ending June 30 shows that, after charging £10,404 for interest on debentures, the divisible profit, including £12,367 brought forward, amounts to £72,910. A dividend on the ordinary shares at 2½ per cent. for the past six months is recommended, making, with the interim dividend, 5 per cent. for the year, with the addition of £2500 to the second reserve fund, and carrying forward £14,410. The Directors took a favourable opportunity which occurred during the past year to combine (under the style of Drakes Limited) the new gas engineering works of the Company with the firm of Jonas Drake and Son, of Halifax—an arrangement from which highly beneficial results are expected. As a consequence, Mr. J. Morton, being identified with a similar competing concern, resigned his seat on the Board, and Mr. J. A. Drake was elected to fill the vacancy.

WANTED, FOR SALE, AND CONTRACT ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

SITUATIONS VACANT.

ASSISTANT OR NIGHT FOREMAN. No. 3901.
CARBONIZING FOREMAN. No. 3899.
ENGINEER and MANAGER. Doncaster Gas Department (Aug. 15).
LAMP INSPECTOR. No. 3898.
MANAGER. Bandon Gas Department (Aug. 25).
NIGHT FOREMAN FOR GAS-WORKS. No. 3897.
OUTDOOR SUPERINTENDENT. Devonport (Aug. 25).
PUPIL FOR MERCHANTS' BUSINESS. Padfield & Co., London.
TRAVELLER, GAS-STOVE TRADE. No. 3893.
WORKING MANAGER. Holsworthy Gas-Works.

SITUATIONS WANTED.

CLERK IN GAS OFFICE. No. 3895.
GAS ENGINEER OR MANUFACTURER'S REPRESENTATIVE. No. 3900.
GAS-FITTER, &c., Warring, Launceston.
WORKING MANAGER. Watson, Shepton Mallet.

SMALL CAPITALIST WANTED. No. 3890.

EXAMINATIONS IN GAS MANUFACTURE.

CORRESPONDENCE CLASSES. No. 3896.

PLANT, &c. (Second-Hand), FOR SALE.

EXHAUSTER AND GASHOLDERS (various). Wright, London.
EXHAUSTER, &c. Ilkeston Gas-Works.
HEATING AND COOKING APPARATUS BUSINESS. Denbur, London.
INTENSIFIED GAS-LIGHT COMPANY'S PATENTS, &c. Ventom, Bull, and Cooper, London.
PURIFIERS. Mablethorpe Gas-Works.
PURIFIERS, SCRUBBER-WASHERS, GASHOLDERS, &c. Firth Blakeley, Dewsbury.
STREET LAMPS, &c. Newmarket Gas Company.

SALE OF STOCK.

LEATHERHEAD WATER COMPANY. Tenders by Aug. 21.

MEETINGS OF COMPANIES.

BARNET GAS AND WATER (Aug. 29); COLNEY HATCH GAS (Aug. 28); NORTH MIDDLESEX GAS (Aug. 27); PORTSMOUTH WATER (Aug 28); RIDDINGS GAS (Aug. 29).

TENDERS FOR

COAL.

THORNEY. 150 to 200 tons.

METERS.

GLASGOW. One Year's Supply. Tenders by Aug. 11.

OIL (Solar).

STOCKTON-ON-TEES. Tenders by Aug. 25.

OXIDE OF IRON.

SALFORD. 1000 tons. Tenders by Aug. 21.

SCRUBBER.

OAKHAM GAS COMPANY.

STORAGE RESERVOIR, &c.

HIGHAM FERRERS and RUSHDEN WATER BOARD. Tenders by Aug. 23.

TAR AND SULPHATE OF AMMONIA.

INVERNESS. Tenders by Aug. 26.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

One Year, 21s.; Half Year, 10s. 6d.; Quarter, 6s. 6d.

Payable in Advance. If credit is taken, the charge is 25s. a year.

All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

Telegrams: "GASKING, LONDON." Telephone: P.O. 1571 Central.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON HOUSE,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications RE OXIDE to the COMPANY as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for GAS-WORKS.

ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

LIME
FOR GAS PURIFICATION.

THE DUNSTABLE LIME COMPANY,

Works: Sewell, Dunstable, Knebworth, Stamford, and Peterborough, Great Northern, Midland, and London and North-Western Railways.

Copy of Analysis of Lime from Knebworth Works—

Calcium Oxide (Quick Lime) . .	98·9
Magnesia and Alumina	0·5
Silica	0·6
	100·0

Head Office: PETERBOROUGH.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.

Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E. First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

EERSTE Hollandsche Yzererts Maaty, ROTTERDAM.

General Manager (for England and Wales)—
CHARLES E. FRY, Leamington; and at Tower Chambers, Brown Street, MANCHESTER.

London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.

General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

BROTHERTON & CO, LIMITED.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

GAS TAR wanted.

BROTHERTON AND CO., LTD., Tar Distillers, Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

COAL GAS TAR wanted.

State Quantity to offer for Prompt and Forward Delivery.

The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.

FIRE Cement, Paint, Mains, Tubes
STREET LANTERNS, GLASS, TOOLS, &c.
BALE & CHURCH,
5, CROOKED LANE, CANNON STREET,
LONDON, E.C.

SULPHATE OF AMMONIA
SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.
For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."
Largest Practice and most Up-to-Date Works in Britain.
JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH CLASS CYCLES at lowest Prices guaranteed and sent on APPROVAL for Cash or GRADUAL PAYMENTS. Catalogue and Testimonials from Gas Managers post free.
MELROSE CYCLE COMPANY, COVENTRY.

PATENTS AND TRADE MARKS
PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.
MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.
19, Farringdon Road, London, E.C.
Telegrams: "Luminosity."

AMMONIACAL LIQUOR wanted.
Brotherton and Co., Ltd., Ammonia Distillers. Works: Birmingham, Leeds, and Wakefield.

STREET AND SHOP LAMPS AND LANTERNS.

MARK DUFFIELD & SONS (Established 200 Years), makers of Street and Shop Lamps to own Pattern and Design. Any description of Lamp made. Inquiries invited.
London Manager: Edward Padfield, West India House, 96 & 98, Leadenhall Street, E.C.
Telegraphic Address: "Eupathy, London."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
Read Holliday and Sons, Ltd., Huddersfield.

PROVINCIAL Gas Companies may profitably consider the advantages offered by ACETYLENE for the PUBLIC and PRIVATE LIGHTING of OUTLYING PORTIONS OF THEIR DISTRICTS, which do not at present justify the expense of laying Coal-Gas Mains from the Central Works.
Correspondence on this subject is invited by the Acetylene Illuminating Company, Limited, 3, Victoria Street, London, S.W.

IT is worth your while to buy direct.
THE RELIANCE LUBRICATING OIL COMPANY, 19 and 20, Water Lane, Great Tower Street, London, E.C., handle all kinds of Lubricating Oils, for Engines, Cylinders, Dynamos, Spindles, &c., Burning Oils, Solar Distillates, Carburetting Oils, and Spirits for Gas Making; Motor Oils, Fuel Oils, Animal, Fish, and Vegetable Oils, &c., for all purposes. Write for our "Trade Mark" Inkstand, sent free to customers. Non-customers, 2s. 6d. each. RELIANCE LUBRICATING OIL COMPANY, London, Glasgow, Newcastle-on-Tyne, &c. Established 1858. Telegraphic Address: "Substral," London; A.B.C. Code used. Telephone No.: Avenue 5891.

WANTED, re-engagement as Working MANAGER of Gas-Works. Practical Carbonizer, Gas-Fitter, Main and Service Layer, &c. Total Abstainer. Excellent Testimonials and References.
Address G. Watson, 19, Zion Hill, Shepton Mallet.

GAS Engineer, expert in Applied Gas and Distributing Plant, desires OPENING, either with Gas Undertaking or Manufacturers. Good commercial experience. Excellent Testimonials.
Address No. 3901, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Situation in Gas Office by a CLERK (Age 21) acquainted with Gas Rental, Residual, and Fittings Books, and routine of office generally.
Address No. 3895, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

WANTED, a Situation as practical GAS-FITTER in a Gas-Works. Main and Service Layer, Meter Fixing and Registration, Cookers, Fires, Incandescent and Street Lamp Repairer. Good References.
Address, C. Warring, Gas-Works, Launceston.

WORKING Manager wanted for small Works. One used to Main and Service Laying, and Meter and Stove Fixing. Wages, 24s. per week, with House, Coal, and Gas.
Apply, with References, to L. H. Pellow, Holsworthy, Devon.

WANTED, an Assistant or Night Foreman. Must be a good Carbonizer, and willing generally to assist in the Retort-House and Works Repairs.
Apply, by letter, giving all particulars as to Age, Experience, and Qualification, to No 3901, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BOROUGH OF NEWCASTLE-UNDER-LYME.
(Gas-Works Department.)

REFERRING to the Advertisement in the "Journal" of the 22nd of July, requesting applications for the position of SECRETARY and CASHIER to this Department, the appointment has been made. As there were so many applications (130), this is to make it known to those who were not successful.

GAS MANUFACTURE EXAMINATIONS.

CORRESPONDENCE Classes. Young Gentlemen coached in Modern Gas Making and prepared for the City and Guilds Examinations (Ordinary or Honours Grade) by an experienced Teacher.
Successes: Six seasons, five medals. Last season's classes, honours medal, nearly 80 per cent. first-class. Confidential.
For Terms, Particulars, &c., apply, by letter, to No. 3896, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

GAS-STOVE TRADE.

FIRST-CLASS Traveller required for North of England. Must be well known and have influence and connection. Only thoroughly experienced applicants considered.
Address No. 3893, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

LAMP Inspector wanted to take charge of about 1000 Public Lamps and 20 Lamplighters and Repairers. Must be a qualified Tinsmith and understand Incandescent Gas Lighting.
Apply, by letter, stating Age, Experience, and Wages required, to No 3898, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

TO PARENTS AND TRUSTEES.

WANTED, an Articled Pupil to learn the art of a Merchant's Business in London Offices. Every care taken. Splendid opportunity. Premium £100. Small Salary given.
Address, in first instance, Messrs. E. Padfield & Co., West India House, 96 and 98, Leadenhall Street, London, E.C.

WANTED, a Night Foreman for a Gas-Works in the North of England. Must be a good Carbonizer, and able to control a large number of Men. Practical experience with Regenerator Furnaces and Sulphate of Ammonia Manufacture preferred.
Commencing Wages £2 2s. per week.
Apply, by letter, immediately, to No. 3897, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BOROUGH OF DEVONPORT.
(Gas Department.)

WANTED, an Outdoor Superintendent to take charge, under the Direction of the Manager, of Mains, Services, and Public Lighting. Salary to commence at £100 per annum, rising to £150.
Applications, with *copies* of Testimonials, to be sent to the undersigned on or before the 25th of August, 1902.
Sidney E. Stevenson,
Engineer and Manager.
Gas-Works, Devonport.

CARBONIZING FOREMAN.

WANTED, immediately, a thoroughly practical Man as CARBONIZING and YARD FOREMAN for a Works manufacturing 400 million cubic feet per annum. Must understand Inclined Retort Settings and Regenerative Furnaces and the general routine of a Gas-Works. House, Coal, and Gas provided.
Apply, by letter, stating lowest wages required, to No. 3899, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

BANDON TOWN COMMISSIONERS (CO. CORK, IRELAND.)

WANTED, a thoroughly Practical MANAGER, for the Bandon Gas-Works. To take charge of the Manufacture and Distribution, to take Meters, and to generally superintend the Outside Work in connection with the Gas-Works. Salary £80 a year, together with House, Coal, and Light. If found competent in his duties, an increase of £10 per year will be given after the first year until £100 be reached)
Applications, accompanied by *copies* of Two recent Testimonials, to be forwarded to the undersigned not later than Monday, Aug. 25, 1902.
By order,
William J. M'Donnell,
Town Clerk.
Office: Gas-Works, Bandon,
Aug. 5, 1902.

BOROUGH OF DONCASTER.

ENGINEER AND MANAGER OF GAS-WORKS.

THE Corporation invite Applications for the position of GAS ENGINEER and MANAGER of their Works. Gas manufactured at present is about 190,000,000 feet per annum.
Applicants must be under forty years of age, and thoroughly up-to-date in all matters appertaining to the Manufacture of Gas, the proper treatment of Residuals, and management of Workmen.
The salary will be £250 a year, with House, good Garden, Coal, and Gas.
Applications, stating Age, Experience, and when prepared to take up duties, together with *copies* of not more than three recent Testimonials, to be forwarded to me, endorsed "Gas Managership," on or before Noon on the 15th of August, 1902.
R. A. H. Tovey,
Town Clerk.
Doncaster, Aug. 2, 1902.

A GOOD Man with knowledge of Gas-Works, Fittings, &c., and possessing a few Hundred Pounds, may purchase a good opening (freehold property).
Address No. 3890, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

OAKHAM GAS COMPANY, LIMITED.

SCRUBBER.

WANTED, for the above Company, either New or Second-hand, a CAST-IRON SCRUBBER, 25 to 30 ft. high by 4 ft. 6 in. to 5 ft. diameter. If Second-hand, must be in first-class condition.
State Price and Particulars to Manager, Gas Office, Oakham.
Gas Office, Aug. 5, 1902.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. Blakeley, Gas Engineer, Thornhill, Dewsbury.

THE Newmarket Gas Company invite OFFERS for about 100 Second-hand 14-inch STREET-LAMPS, Cocks, Borradaile's No. 4 Governors, and Cradles.

FOR SALE—A 15,000 cubic feet per hour EXHAUSTER, with Valves, &c. Makers, Tangyes Ltd.
Apply to the Manager, Gas-Works, Ilkeston.

TO BE SOLD—
EXHAUSTING PLANT, complete with Engine and Boiler, for 3000 to 4000 feet per hour.
GASHOLDER, 16 ft. by 10 ft. with 4 Columns.
GASHOLDER, 20 ft. by 10 ft. with 4 Columns and Suspension.
GASHOLDER, 45 ft. by 14 ft. with 5 Columns and Two Lifts.
Write J. Wright, 181, Queen Victoria Street, E.C.

FOR SALE—Two 5 ft. square Purifiers, Four Layers Wood Grids, two 4-inch Four-Way Valves, and 4-inch Connections. In good working order. Tenders invited.
Apply to the Gas-Works, Mablethorpe, S.O.

TO MANUFACTURERS AND CAPITALISTS.

HEATING and Cooking Apparatus Manufacturing Business for Sale (London district), including several British and Foreign patents for Economic and Hygienic Gas Heating and Cooking Apparatus, with registered Designs and Titles. An exceptional opportunity for Manufacturers and Capitalists to acquire a thorough genuine business with valuable patents on economic lines. Inquiries and fullest investigation solicited. Principals only treated with.
Address in first instance, Denbur, 279, Chapter Road, Willesden Green, London, N.W.

HIGHAM FERRERS AND RUSHDEN WATER BOARD.

SYWELL SCHEME.

OWING to the Bank Holidays intervening, and the late appearance of the Advertisement for TENDERS for the above, the time for sending in the latter has been extended to Saturday, Aug. 23.
George S. Mason,
Clerk to the Board.
Rushden, R.S.O.,
Northamptonshire.

THE Thorney Gas Company invite TENDERS for the supply of about 150 to 200 Tons of good GAS COAL for the ensuing Year from Aug. 15.
Tenders to be addressed to the Chairman.

GLASGOW CORPORATION.
(Gas Department.)

THE Corporation invite Tenders for the supply of such Meters as may be required by them for twelve months from date of acceptance. Forms of Tender may be obtained on application to Mr. Foulis, the Manager, at the Gas Office, 45, John Street, Glasgow; and sealed offers, marked "Tender for Gas Meters," and addressed to the Subscriber, will be received by him on or before Tuesday, the 12th of August.
The Corporation do not bind themselves to accept the lowest or any Offer.
J. D. Marwick,
Town Clerk.
City Chambers, Glasgow,
July 31, 1902.

CONTRACT FOR TAR AND SULPHATE OF AMMONIA.

THE Inverness Gas Commissioners are prepared to receive OFFERS for TAR and SULPHATE of AMMONIA produced at their Works up to the 15th of May, 1903.
Particulars may be had by applying to the Manager at the Gas-Works.
Tenders, endorsed and addressed to Kenneth Macdonald, Esq., Clerk to the Commissioners, will be received up to Tuesday, the 26th curt.
The Commissioners do not bind themselves to accept the highest or any Tender.
Gas-Works, Inverness,
Aug. 7, 1902.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

THE Gas Committee are prepared to receive TENDERS for the supply of 1000 Tons of OXIDE OF IRON PURIFYING MATERIAL. Full Particulars may be obtained on application to Mr. William W. Woodward, Engineer, Gas Offices, Bloom Street, Salford.
Sealed Tenders, endorsed "Oxide of Iron," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday the 21st of August, 1902.
The Committee do not bind themselves to accept the lowest or any Tender.
L. C. Evans, Town Clerk.

STOCKTON-ON-TEES CORPORATION.

SOLAR OIL.

THE Gas Committee of the above Corporation are prepared to receive TENDERS for the supply of SOLAR OIL that may be required for Gas-Making purposes at the Stockton Gas-Works up to the end of March, 1903.
Particulars, &c., may be had on application to the undersigned.
Tenders, sealed and endorsed "Tender for Solar Oil," to be sent to the Town Clerk not later than Noon of the 25th day of August, 1902.
The Gas Committee do not bind themselves to accept the lowest or any Tender.
Wm. Ford,
Manager.
Corporation Gas-Works,
Thompson Street,
Stockton-on-Tees, Aug. 1, 1902.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Thursday, the 28th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1902, to declare Dividends, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 15th to the 28th of August inst., both days inclusive.

By order,
ERNEST L. BURTON.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C., Aug. 7, 1902.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Wednesday, the 27th day of August inst., at Twelve o'clock Noon, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1902, to declare Dividends, and for other purposes.

And Notice is Hereby Given, that immediately after the conclusion or adjournment of the Business of the Ordinary General Meeting, a SPECIAL GENERAL MEETING of the Proprietors will be held, at which a Resolution will be submitted to the Proprietors authorizing the raising, either by the issue of Ordinary Shares or Stock, or Preference Shares or Stock, or partly by the issue of Ordinary and partly of Preference Shares or Stock, of the balance of the Capital authorized to be raised in pursuance of the North Middlesex Gas Company's Act, 1895; also a further Resolution authorizing the Directors to exercise the borrowing powers conferred by the said Act in respect of the issue or issues made, or to be made, of the said authorized capital.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 14th to the 27th of August inst., both days inclusive.

By order,
ERNEST L. BURTON,
Secretary.

Secretary's Office: 5, Great Winchester Street,
Old Broad Street, London, E.C., Aug. 7, 1902.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

NOTICE OF EXTRAORDINARY GENERAL MEETING OF SHAREHOLDERS.

NOTICE is Hereby Given that an EXTRAORDINARY GENERAL MEETING of the Shareholders of the above Company will be held at the Company's Offices, Commercial Road, Portsmouth, on Thursday, the 28th day of August, 1902, at Three o'clock in the afternoon, for the following purposes:—

To authorize the raising of ADDITIONAL CAPITAL not exceeding in the whole (including any premium which may be obtained on the sale thereof), the sum of £123,000 under and in accordance with the powers and provisions of "The Borough of Portsmouth Water Order, 1902," and to authorize the borrowing on Mortgage in respect of such additional Capital any sum or sums not exceeding in the whole one third part of the amount of the additional Capital by the said Order authorized to be raised and at the time actually issued by Shares or Stock and fully paid up pursuant to the provisions of the same Order, and in pursuance of the Acts or parts of Acts of Parliament incorporated with such Order, and to take such steps and to adopt such Resolutions in reference to the foregoing subjects respectively, as may be deemed fit.

Dated the 31st day of July, 1902.

By order of the Board of Directors,
J. L. WILKINSON,
Secretary to the Company.

Offices: Commercial Road,
Portsmouth.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 29th day of August, 1902, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, to consider and determine as to the passing of a Resolution for the Conversion or Consolidation into "D" Capital Water Stock of the Company of 2888 Shares fully paid-up "D" Water Shares of £10 each, forming part of the Additional Capital authorized by the Company's Act of 1883, such Stock to be divided among the holders entitled to the said Shares, according to their respective interests therein; and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th of August, both inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, Aug. 1, 1902.

LEATHERHEAD AND DISTRICT WATER-WORKS COMPANY.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER £1325 FOUR PER CENT. DEBENTURE STOCK, in accordance with the powers of the Leatherhead and District Water Order, 1890.

Particulars of same, with Form of Tender, can be obtained at this Office on application to the undersigned; and Tenders must be sent in on or before Eleven o'clock on Thursday morning, the 21st of August, 1902.

By order,
JOHN YOUNG,
Secretary.

Church Street, Leatherhead,
July 28, 1902.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Offices of the Company, No. 30, Gracechurch Street, in the City of London, on Friday, the 29th day of August, 1902, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 16th to the 29th of August, both days inclusive.

By order of the Board,
ERNEST W. DREW,
Secretary.

Offices: 30, Gracechurch Street,
London, Aug. 1, 1902.

Re the

INTENSIFIED GAS-LIGHT COMPANY, LTD.

(IN VOLUNTARY LIQUIDATION.)

THE valuable British, American, and COLONIAL PATENTS in the above Company, GAS-LAMPS and FITTINGS, HIGH and LOW PRESSURE INCANDESCENT BURNERS, FORCE-PUMP, GAS-GOVERNORS, ROOT'S AMERICAN ROTARY BLOWER, OFFICE FURNITURE, SMITH "PREMIER" TYPEWRITING MACHINE, and EFFECTS.

Messrs. VENTOM, BULL, and COOPER will SELL the above BY AUCTION, on the Premises, 3, WILSON STREET, DRURY LANE, W.C., on Wednesday, Aug. 27, at Two o'clock precisely.

Catalogues may be had of the Liquidator upon the premises, and of the AUCTIONEERS, 35, OLD JEWRY, E.C.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

Price 6s., Cloth Bound, Bevelled Boards.

THE

GUIDE-FRAMING OF GASHOLDERS

BY

F. SOUTHWELL CRIPPS, Assoc. M. Inst. C.E.

LONDON:

WALTER KING, 11, Bolt Court, Fleet Street, E.C.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.

165, QUEEN VICTORIA STREET, E.C.;

And at STROUD, GLOUCESTERSHIRE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

RAVENSTHORPE, NEAR DEWSBURY.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO

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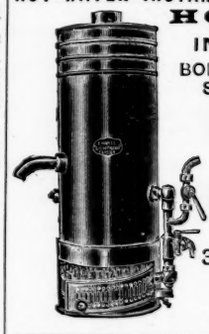

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